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Drive2Transform

D.1.1.1 TRANSFORMATION READINESS MODEL (TRM)

Guidelines for how to use the TRM

Version 1

11 2024

D.1.1.1 TRANSFORMATION READINESS MODEL

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Content

1. Introduction

1.1. Objective

The objective of A.1.1 and related D.1.1.1 is to present a Transformation Readiness Model that enables the **assessment of capacities of regional business support ecosystems** to foster the transformation of SMEs in automotive industry. Therefore, different dimensions and indicators are selected with which transnational benchmarking is possible.

The assessment of the transformation readiness of each region aims at **identifying relevant innovation fields for transformative activities** and therefore **builds a basis for future transformation activities**. Based on this model the partners will perform first a **regional analysis** and second a **transnational benchmarking** also to guarantee the quality of the analyses obtained and to ensure a **transnational holistic approach.**

This transformation readiness model serves as a basis for the further transformation activities and presents the status quo of the participating regions separately and in comparison. This model will be validated and updated annually as part of the Transnational Automotive Open Transformation Platform (TOP), also beyond project.

The aim was to create the Transformation Readiness Model in such way that **regions are supported** by

- analysing their areas of specialization in the context of transformative activities,
- identifying opportunities for structural transformation: e.g. new combinations and synergies, and
- better targeting cross-regional collaboration that can create synergies.

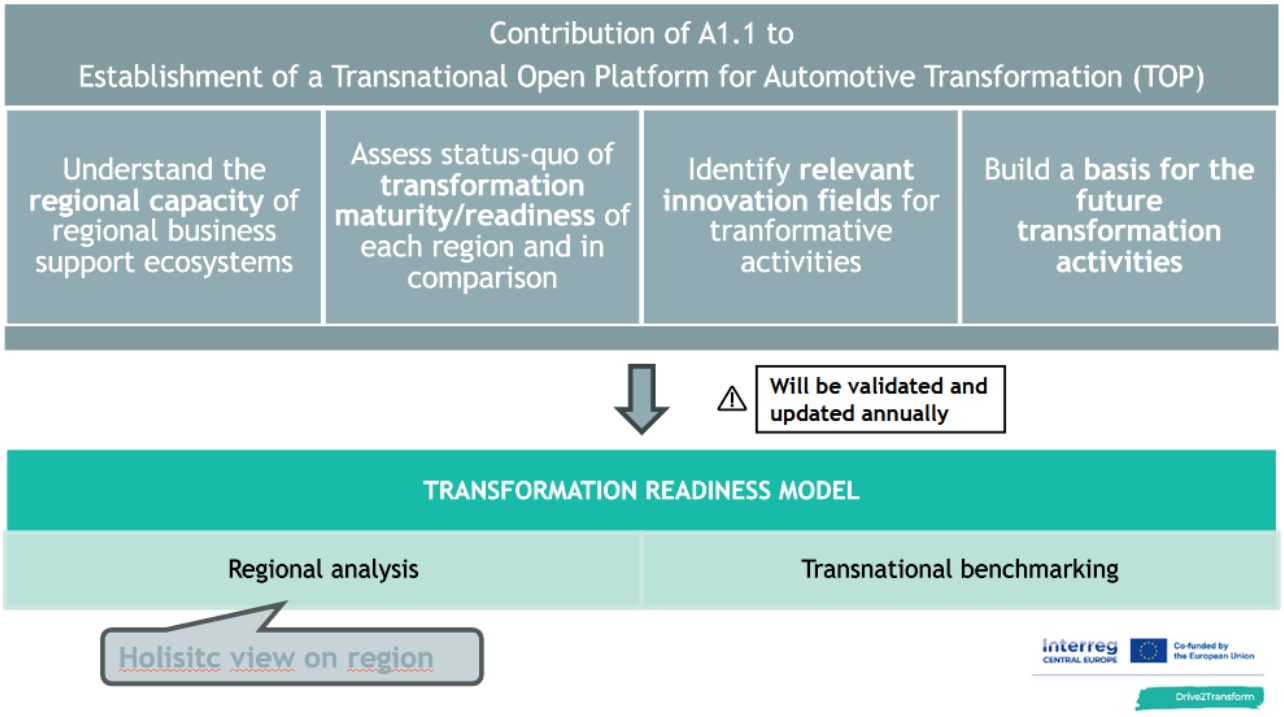


Figure 1 Transformation Readiness Model (TRM) – Structure & Objectives

The objectives of this document are to provide guidance:

on how to select stakeholders (businesses, organisations, BSO; incl. advisory board) per region to deliver inputs for the TRM

- on how to use the semi-structured TRM catalogue of questions, and
- on how to analyse the TRM catalogue of questions in such way that it can be used by project partners in a coherent way for regional and transnational analysis, including D.1.1.2 Map of Development Opportunities, Technology and Skills Gaps in Each project Region (to be delivered in M6) and D.1.1.3 Peer Reviewed Transnational Benchmarking Reports (to be delivered at M6).

For the data analysis and interpretation two different statistical approaches have been developed which need to be tested with a bigger sample size when doing the annual update. Both approaches are presented in this guideline: Transformation Readiness Score and Multiple Correspondence Analysis (MCA).

1.2. Planning

The suggested planning for the regional and transnational analysis in A.1.1 using the Transformation Readiness Model was as follows:

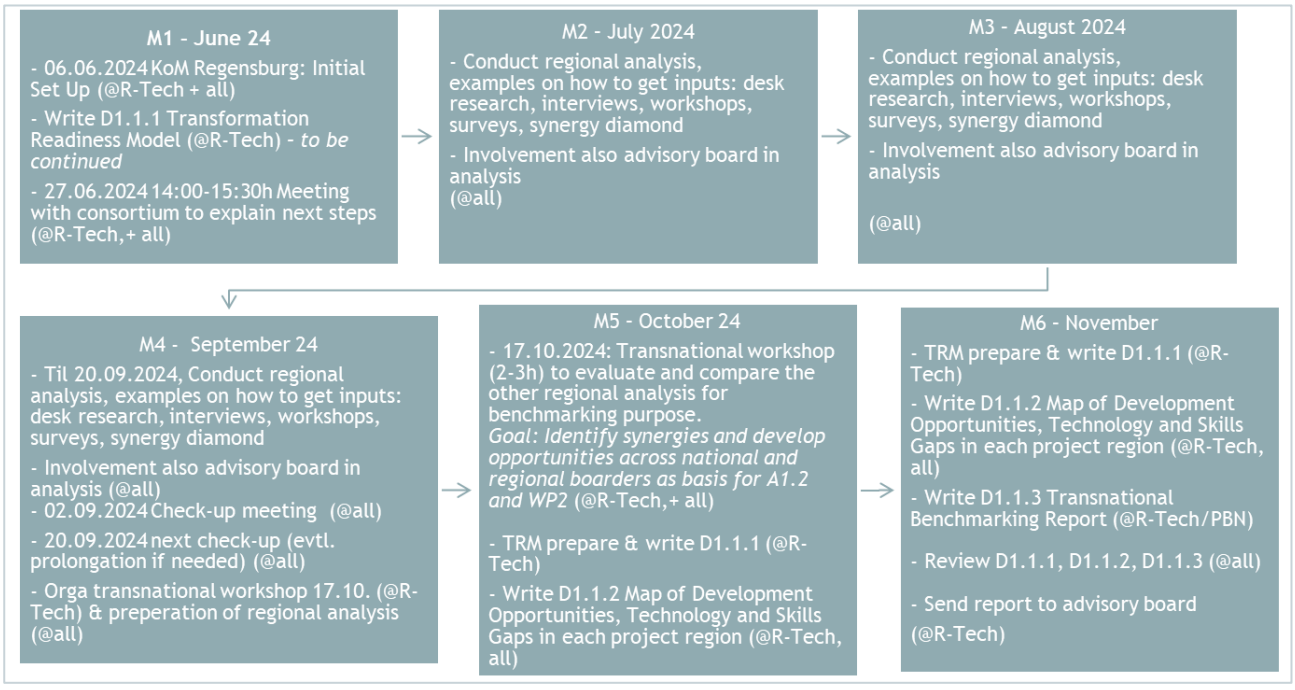


Figure 2 A.1.1 Planning / Timeline

In June it started with preparation and drafting of a catalogue of questions to be used for regional analysis on Transformation Readiness to be finalised mid-July. In July, August and September this TRM catalogue of questions was used for collecting inputs for regional analysis. October and November 2024 was time to compare the regional analysis and do the benchmarking as well as writing and reviewing the reports D.1.1.2 and D.1.1.3.

In October, a hybrid workshop was held to discuss the EU survey. This was a two-day hybrid workshop held in Pilsen, Czech Republic, and online. During a half-day session, each region presented and discussed their results. In the afternoon, the results were summarized, and an initial concept for a Transnational Readiness

Index was discussed. After the workshop, the insights were reviewed and refined, leading to the development of the adjusted Transformation Readiness Model (see the following chapter).

Additionally, graphics were created based on collaboratively developed guidelines, and the export of survey results was automated. Results can now be automatically updated, processed, and shared for each region. There are plans to extend this automation to display results by company size. Furthermore, additional metrics were defined (such as range of responses, frequency tables, data highlights, median, mode, and other calculation methods).

We decided to include frequency tables and average values of each region compared to Europe in the regional report, alongside the regional expertise and data insights. Insights from regional expertise, gathered primarily through survey responses, will complement the survey results. Any additional feedback may originate from open-ended survey questions ("other") or, in cases of physical meetings held to collect survey responses, from in-person feedback provided during these interactions.. In the transnational report, the analysis will be further enhanced with two methodologies: the Transformation Readiness Model Score in defined categories and Multiple Correspondence Analysis (MCA). Both methodologies are described in the following chapters.

These form the basis for Activity 1.2, where scenarios for all thematic areas will be developed for short-, mid-, and long-term perspectives. For this, a training session on the Design Thinking and Synergy Diamond methodologies will be conducted in December. Each region will plan two regional workshops in January/February 2025 and April 2025 to develop these scenarios. This, in turn, will form the foundation for the roadmap and the Transformation Readiness Platform, which is planned to go online in 2025.

Several meetings took place for A1.1, including:

- June 2024: Overall kick-off meeting to present and discuss timeline for A1.1.
- Mid-July 2024: The TRM catalogue of questions for regional analysis was discussed and finalized.
- Mid-September 2024: Progress was reviewed, initial lessons learned were shared, guidelines were adjusted/improved as necessary, and preparations for the transnational workshop in October 2024 were started.
- Beginning October 2024: Transnational workshop. Part of the consortium could meet up in Pilsen and the others were joining online. The workshop was used to start with the regional analysis and follow up with first result presentation and discussion of those on transnational level.
- Beginning November2024: Short meeting to discuss among WP1 lead and A1.1- and A1.2 lead with regard to further planning and usage of various methodologies for scenario building.
- End November 2024: Closing with the consortium meeting and some WP-leader meeting.

2. Transformation Readiness Model

The Transformation Readiness Model has a bottom-up approach and consists of four steps:

Figure 3 TRM - Process

2.1. Data collection with semi-structured TRM catalogue of questions

Involved stakeholders

The **focus is on regions** and the comparison of these, not directly on the single organisations itself. Nevertheless, organisations need to be involved in the assessment process to ensure to have a broad and also practical view on Transformation Readiness Level in the regions.

In total, 9 regions are analysed covering eight countries in Central Europe. In the following table is an overview of regions that are covered in this project and its related project partner covering that region.

Table 1 Project partners and related regions

#	Project Partner		NUTS 0 Country	NUTS 1 Region	NUTS 2 Region	NUTS 3 Region	Code in analysis
1	LP1 Cluster Mobility & Logistics (R-Tech GmbH)	Cluster M&L	DE Germany	DE2 Bavaria	DE23 Upper Palatine	-	**GER-BY**
2	Business Upper Austria - OÖ Wirtschaftsagentur GmbH	Biz-Up	AT Austria	AT3 Western Austria	AT31 Upper Austria	-	**Austria**
3	Regional Development Agency of the Pilsen Region	RDA Pilsen	CZ Czech Republic	CZ Czech Republic	CZ03 Southwest	CZ032 Pilsen Region	**Czechia**
4	Pforzheim University	PU	DE Germany	DE1 Baden-Württemberg	DE12 Karlsruhe	DE127 Northern Black Forest	**GER-BAWÜ**
5	Pannon Business Network Association	PBN	HU Hungary	HU2-Transdanubia	HU21 - Central Transdanubia & HU22-Western Transdanubia & HU23 - Southern Transdanubia	-	**Hungary**
6	NOI S.p.A	NOI	IT Italy	ITH1 Provincia Aut Bozen	ITH10 Bolzano	-	**Italy (IT-H)**
7	Katowice Special Economic Zone SA	KSSE/SA&AM	PL Poland	PL2 South Macroregion	PL22 Silesia	-	**Poland**
8	Chamber of Commerce and Industry of Slovenia	CCIS	SI Slovenia	-	-	-	**Slovenia**
9	SEVA – Slovak Electric Vehicle	SEVA	SK Slovak Republic	-	SK01 Bratislavský kraj	SK010 Bratislavský kraj	**Slovak republic**

To receive a realistic view on the Transformation Readiness Level in the regions mainly **companies**, especially SMEs, in the automotive sector, and **Business Support Organisations (BSO's)** are targeted to receive inputs for the TRM. Through cumulative analysis of the inputs the regional analysis is concluded bottom-up. Results of the TRM analysis on regional and transnational level should then be exploited by policy makers and authorities.

The minimum number of companies answering the questions for the TRM was **ten per region** plus some BSO and others such as researchers and policy makers (KPI taken from A.1.2) **for this first project period** (P1, June-Nov. 2024). According to the Central Limit Theorem, if the sample size is **n > 30**, the distribution of the sample mean can be approximated as normal, allowing the use of statistical methods that assume normality. Therefore, for the next periods it is planned to increase the number of participants.

Include as many people as you feel is necessary for you to build up a clear picture of each regional ecosystem. It may be relevant to also have stakeholders being able to refer to all the four thematic areas of Drive2Transform to receive precise answers on those fields as well as firms who struggle with current situation to collect inputs for WP2 Capacity Building.

Semi-Structured TRM catalogue of questions

The TRM itself consists of a semi-structured catalogue of questions (similar to semi-structured interviews guidelines) combining **quantitative and qualitative measures** for the Transformation Readiness Level analysis on regional level asked to companies and BSOs (two different sets of questions). Through the semi-structuring a transnational benchmarking is possible, but still there is some flexibility to also adapt to regional specificities.

For the implementation of activity A.1.1, the decision was made to go for a practical approach. As all following activities in WP1-WP3 rely on the output of A.1.1 this activity is already prepared in such way, that it can be used as reference point for scenario building, capacity building and use case development. So, the TRM catalogue of questions consist also of some questions not directly linked to transformation readiness assessment.

In Annex you can find the full catalogue of questions to be used for analysing the Transformation Readiness Level. The catalogue is also transferable to other regions.

The catalogue is structured into categories. Each question has a unique number and is assigned to a category. The following categories are included:

Categories
10 RISKS
12 PRESSURE
13 READINESS
15 OPPORTUNITIES
18 ELECTRIFICATION REGIONAL
19 AUTOMATION REGIONAL
20 CONNECTIVITY REGIONAL
21 PLATFORM REGIONAL
23 SPECIALISATION
24 PERSPECTIVES

Table 2 TRM question categories

There are open-ended questions, multiple-choice questions, and scoring questions. A portion of the questions is used in the TRM score for evaluation. Colour coding helps to analyse the data in the analysation tool. In the following figure the assumed effect on the transformation readiness level is presented.

Figure 4 Overview of factors and their assumed effect on the transformation readiness level ("+" = positive impact, "-" = negative impact)

The aim is to engage the stakeholders also in further activities of the project, so the TRM is a good basis to later design demand-based services throughout Drive2Transform. Therefore, a precise section on future activities and possible involvement in Drive2transform was added.

You have different options **to use the TRM catalogue to collect the data for regional and transnational analysis.** You can do **interviews (online/offline), use it as an online questionnaire and/or organise a workshop in your region involving all relevant stakeholders**. In general, it is expected to receive more detailed insights via 1:1-meetings, but a higher involvement when distributing an online questionnaire.

The catalogue of questions is available **online-survey on EU survey tool**. Answers need to be protocoled and inserted in the online-survey-template as this will deliver a structured overview of all inputs for the regional and transnational analysis. Also, the export of data in Excel format is possible. Based on that Excel export data can be automatically analysed via a precise tool developed during this Activity A1.1.

Note, that data can be collected in national language, but it needs to be translated to **English** when putting the info in the online-survey. Transnational analysis is not possible otherwise.

When answering the TRM catalogue of questions sometimes the definition of the **four main thematic areas** of Drive2Transform are not always clear to the respondent. Therefore, a **reference model** (annex 1 of the survey) for each of the four thematic areas was added with an overview of each areas main products (for connectivity and platform economy also services), critical production technologies and critical competencies. In addition respondents could find in annex 2 of the survey overall **competitive advantage factors for automotive regions**. The two annexes are in the appendix of this document.

The tool EU survey was chosen as it helps to collect all interview results in a structured way. GDPR is ensured. Only project partners do have access to the EU survey tool.

Excursus: Some practical guidelines to run the TRM catalogue with interviews

Prepare for the interview (eg. have all necessary material with you, check website of organisation).

Let interviewees know in advance what you'll ask them.

Set aside at least 50 minutes for each interview.

Clear your head between interviews.

If necessary, ask an interviewee to wait while you make a note.

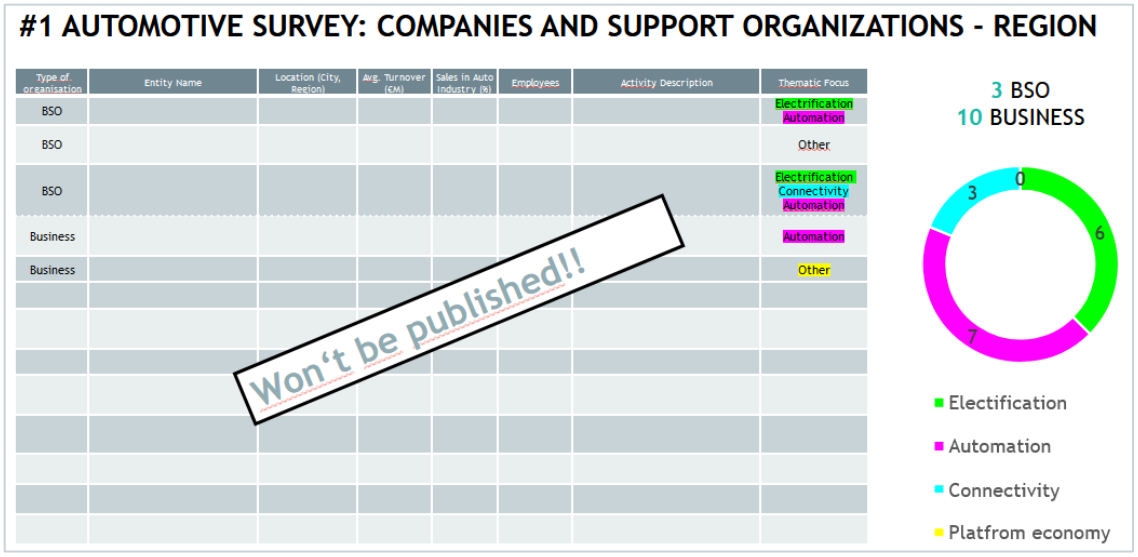
Decide for yourself whether you'll record interviews and ask for permission.

Document the outcomes right after.

2.2. Regional Analysis

Based on the TRM catalogue of questions partners can perform first a regional analysis. **The key elements for the regional analysis have been as followed:**

- Collection of inputs for the regional analysis by using the TRM catalogue of questions (each partner)
- Descriptive statistical analysis of the answers of the TRM catalogue of questions (task leader R-Tech)
- Qualitative analysis of the TRM catalogue of questions, especially the open questions (each partner), e.g. by using the provided slide deck:
  - #1 Overview of companies and BSO that answered the catalogue of questions



  - #2 Regional factsheet summarizing a description of the region and business support ecosystem, risk factors, skills and technology gaps, and missing services for business support. The factsheet per regions purpose is to understand the general situation in the different regions and is used to map development opportunities, technology and skills gaps (D.1.1.2) as well as to define the status quo of strategy in each region to be used as baseline for scenario building in A1.2.

#2 REGIONAL FACTSHEET - REGION

Description of the region	*Texttexttext*

Capacities for transformation: synthesis of questions and answers

Description of the business support ecosystem	*texttexttext*
Q11. Risk factors impacting business continuity	*Texttexttext OR table/figure*
Q14. Readiness gaps hindering entities from starting a transformation process	*Texttexttext OR table/figure*
Q17. Skills gaps	*texttexttext*
Q17. Technology gaps	*texttexttext*
Q27. Missing services for business support:	*texttexttext*
Q22. Other comments regions need to consider for regional competitiveness	*texttexttext*
Further links & studies regarding the region	*texttexttext*

- #3 Key takeaways

#3 KEY TAKEAWAYS - REGION

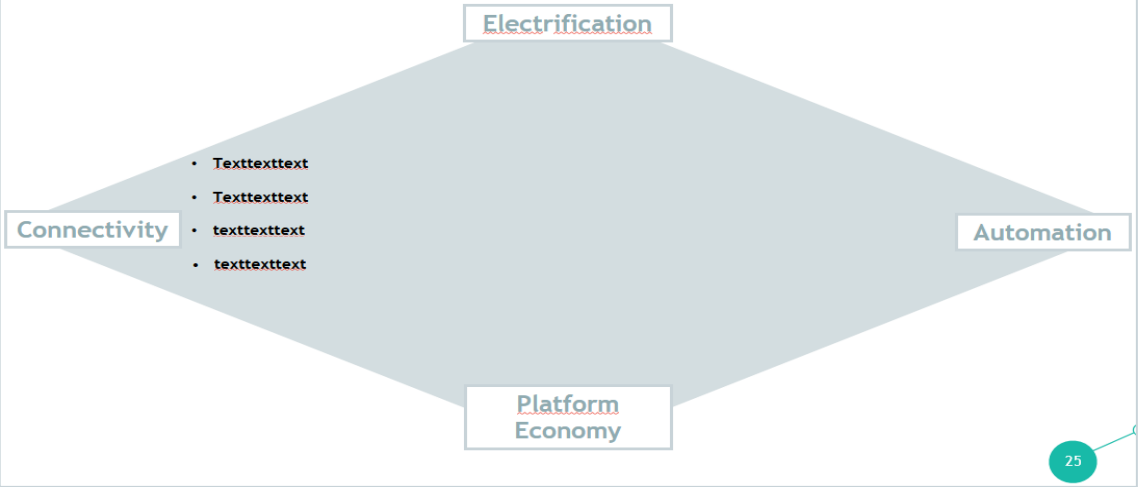
1. **Titel**
Texttexttext

2. **Titel**
texttexttext

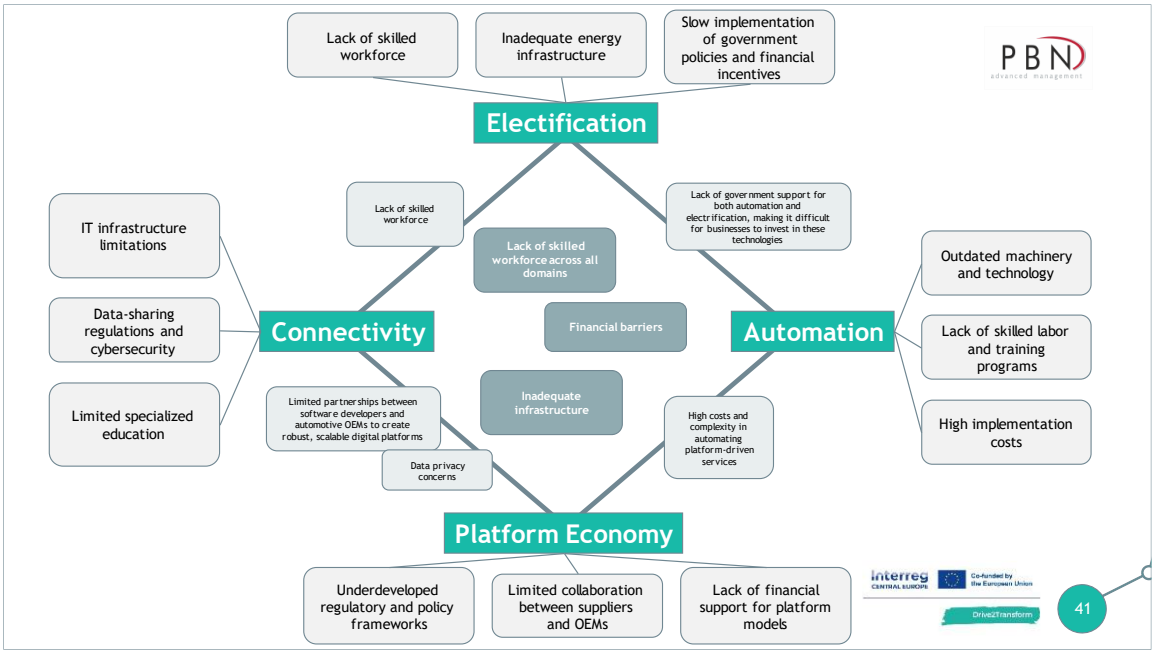
3. **Titel**
texttexttext

- #4 Mapping of challenges, risks, and other hindering factors appear across the 4 focus topics in the regions to prepare for using the synergy diamond method

#4 CHALLENGES - REGION



Example in more detail of PBN presented during the Pilsen Workshop:



It was mentioned in the proposal that the synergy diamond methodology will be used in this A1.1 period for the regional analysis. In period one of the project only the first step of the synergy diamond method was completed when defining precise challenges with this #4 challenge mapping. After transnational comparison it is clear that all regions have a huge overlap in its big challenges. Next step is to define the cornerstones of the diamond which cover the priority areas, which need special focus. The axes of the diamond represent **new combinations between priority areas**. Based on these transformative activities on regional level but also transnational level can be explored.

Synergy diamond is a **new approach to generate transformative activities** by identifying relevant innovation fields. The transformation of automotive industry is such a wide topic. So, the idea behind the synergy diamond is to "narrow down the relevant "search field" in order to achieve tangible results **relevant for the region or for cross-regional cooperation**"[1]. The goal is to also capture opportunities for interregional cooperation. Originally, the tool was developed as S3-Synergy-Diamond "based on the assumption that transformative activities mainly emerge between existing priority areas as a result of increasing industrial convergence."[2] As mentioned in the proposal the methodology needs to be adapted so that it is fitting in Drive2Transform context. After some discussions among partners it was decided that a special training on that methodology is needed to proceed further. This is planned for December 2024. Synergy methodology will be applied in Activity 1.2 as the foundation for scenario development. Each partner will be trained so that they can use the methodology in their regional scenario building workshops with external stakeholders.

In summary, partners are responsible to analyse their regions by themselves **delivering their region's factsheet, challenges and key takeaways. Template can be found on the Drive2Transform website.** Activity leader **Cluster Mobility & Logistics provides in** parallel the **descriptive statistical analysis** and visualisations as well as TRM score and MCA analysis (see next chapter). In D.1.1.2 each partner is responsible for adding the written analysis part themselves. If other that project partners are interested in using the TRM please get in contact with the project.

[1] p. 50, https://www.alpine-space.eu/wp-content/uploads/2022/06/s3-4alpclusters-final-publication-interactive.pdf
[2] p. 51. f., https://www.alpine-space.eu/wp-content/uploads/2022/06/s3-4alpclusters-final-publication-interactive.pdf

2.3. Transnational Analysis

After the status-quo analysis of the single regions the results will also be compared to identify possible synergies and development opportunities as well as complementary competences and needs across national and regional borders. This should support the regions to define transformative activities to be developed cross-regional.

For the transnational analysis of the Transformation Readiness Level of Central Europe different knowledge resources were used. The basis builds the **different regional analysis** (incl. Region's factsheet, D1.1.2). Furthermore, the **partners knowledge** and **previous research, studies and analysis** will be included in the transnational analysis which should be a solid information background.

The benchmarking process consists of two phases in which all partners were engaged whilst R-Tech is lead organiser:

(1) Transnational workshop to evaluate and compare the nine regional analysis

(2) Preparation and review of D.1.1.3 Peer Reviewed Transnational Benchmarking Reports

When organising such **transnational workshop** like the Drive2Transform one in Pilsen all partners which regions should be analysed need to be present. For Drive2Transform that meant each project partners was a representative for its region. As conductor of regional analysis they should be able to present the regional innovation capacities, resources, knowledge and expertise on relevant business opportunities in the region.

In order to create a fruitful working atmosphere a common knowledge base needs to be set up. Therefore, each partner should present its regional analysis once in the beginning of the workshop and in best case it should already be online available for other partners some days prior to the workshop. Even though hybrid format was done, on-site workshop would be preferred for this task.

In preparation for such workshop the descriptive statistics with **TRM score and MCA analysis** (see next chapter) should be used.

2.4. Transformation Readiness Score (TRM score)

The Transformation Readiness Score is an analysis based on a survey of companies and public institutions/business support organizations to assess the position of the company or region within the automotive sector. The survey specifically examines the areas of Electrification, Automation, Connectivity, and Platform Economy.

The 117 survey questions include rating-based questions (typically on a 1-5 scale, with 1 = very poor and 5 = very good), as well as multiple-choice and open-ended questions. The 89 rating questions are incorporated into the TRM model, and together with the remaining questions, they provide a qualitative, comprehensive picture. The score adds value by enabling comparisons between companies, regions, and countries. Additionally, it allows for the observation of developments over time.

The score is fundamentally calculated based on the following categories:

categories	questions	score weighting		
10 RISKS	3	10%		Company related
12 PRESSURE	3	10%		
13 READINESS	3	10%		
15 OPPORTUNITIES	4	10%		
18 ELECTRIFICATION REGIONAL	19	10%	REGIONAL FACTORS 40 %	Regional related
19 AUTOMATION REGIONAL	17	10%		
20 CONNECTIVITY REGIONAL	17	10%		
21 PLATFORM REGIONAL	15	10%		
23 SPECIALISATION	4	10%		
24 PERSPECTIVES	4	10%		

To give one example, there are three questions related to the category of Risk. From these three questions, a score is calculated for the Risk category, which has a weighting of 10% in the overall score. (For questions in the Pressure and Risk categories, the score is higher the lower the perceived risk and pressure are.)

Other categories considered include Readiness for Transformation and perceived Opportunities. Here, as in all other questions, the score increases the more prepared or positively the companies rate themselves.

The additional sections focus on the region. These assess how well the region is positioned in the areas of Electrification, Automation, Connectivity, and Platform Economy. Additionally, they evaluate the region's level of Specialization and perceived Perspectives. Each category is weighted at 10%, so the total equals 100%.

An example of score calculation for a positive question: **13. To ensure your entity's business continuity in the automotive sector from 2024-2030, how would you rate your entity's readiness to adapt in the short term?**
Response options: [1 = not ready at all, 2 = slightly ready, 3 = moderately ready, 4 = mostly ready, 5 = completely ready]
Criteria: Readiness among current employee competencies

In the TRM Score, responses are weighted as follows:

1 = 0 points, 2 = 25 points, 3 = 50 points, 4 = 75 points, and 5 = 100 points.

Example: Company A responds to the three questions in Block 13 READINESS with answers 2, 4, and 5. This results in a score of 25 + 75 + 100 = 200 points, which is then divided by the number of questions. This yields 200/3 = 66.7, the READINESS SCORE. This score is then weighted at 10% in the overall result.

For the **Risk** and **Pressure** Score, the scoring system is reversed because a higher risk level negatively impacts the Transformation Readiness Score. In this system, a score of **0 points** translates to a **100** on the scale, while a score of **5 points** corresponds to a **0**. This ensures that a higher risk rating accurately reflects greater difficulty in achieving transformation.

categories	score	score weighting	positive/negative
10 RISKS	66,7	10%	negative
12 PRESSURE	50	10%	negative
13 READINESS	33	10%	positive
15 OPPORTUNITIES	54	10%	positive
18 ELECTRIFICATION REGIONAL	67	10%	positive
19 AUTOMATION REGIONAL	68	10%	positive
20 CONNECTIVITY REGIONAL	70	10%	positive

21 PLATFORM REGIONAL	71	10%	positive
23 SPECIALISATION	35	10%	positive
24 PERSPECTIVES	34	10%	positive

The average TRM score in this example is 54.87. Based on the current survey data, we assess this score as "Moderate Ready" for the company. It is important that the data pool continues to grow consistently, allowing for potential adjustments in weightings as well.

Assessment Ranking:

Score: >60 Transformation Ready

Score: 50-60 Moderate Ready

Score: 40-50 Limited Ready

Score: 30-40 Low Ready

Score: <30 Not Ready

2.4.1. Company level

The score calculated for the company, as outlined above, serves as a reference point. The company can now evaluate its position in each of the examined categories, ranging from “Not Ready” to “Transformation Ready.” This allows the company to be categorized within each area. In areas with potentially lower scores, further detailed analysis can be applied. In the transnational report, the MCA methodology is used to extract additional insights from the survey results. For further analysis, responses from open-ended questions and multiple-choice questions are included. Combined with the knowledge levels in the regions from the interviews, this creates a solid foundation to make the current status comparable.

2.4.2. Regional/transnational level

Based on the calculation model, data from surveyed companies in each region is aggregated, and averages are calculated for each region. There are 9 regions in total, including 2 from Germany and 8 from other Central European countries.

For example, with 10 surveyed companies:

Company A: Score 54.87
Company B: 60.12
Company C: 70.5
Company D: 66.34

Company E: 54.32
REGION SCORE: 61.23

The regional scores are then compared with the European average and with the scores of other regions. Based on observed differences or notable findings, further detailed analyses can be conducted using the MCA methodology or open-ended questions. The TRM model provides a solid foundation for analyzing results and serves as an initial step for further project phases. Based on these findings, for example, conferences or expert groups can engage in discussions to derive corresponding measures. It is essential to ensure that the survey is supplemented with additional data.

The main advantage of a Transformation Readiness Score for companies, regions, and countries lies in its ability to provide a standardized benchmark for assessing and comparing readiness levels across various sectors and geographies. Here's a breakdown of the key benefits:

1. **Comparability and Benchmarking**: The score offers a unified metric, allowing companies, regions, and countries to assess their relative positioning in key areas such as electrification, automation, connectivity, and platform economy. By providing a standardized measure, it highlights strengths and gaps, enabling informed comparisons with industry peers or neighboring regions.
2. **Tracking Progress Over Time**: By regularly calculating the Transformation Readiness Score, organizations and regions can monitor changes and improvements over time. This helps to track the effectiveness of initiatives, identify trends, and adapt strategies to meet evolving industry demands.
3. **Strategic Planning and Investment Guidance**: The score can guide strategic planning by pinpointing areas needing investment or improvement. For companies, it helps align resources with transformation goals, while for regions or countries, it supports targeted economic development and investment in specific sectors.
4. **Enhanced Decision-Making**: With a clear overview of readiness across various transformation categories, decision-makers can prioritize initiatives that will have the highest impact on readiness. It also enables governments and organizations to support companies and regions that are lagging behind, thus promoting balanced growth.
5. **Encourages Competitiveness and Innovation**: The visibility into readiness levels fosters a competitive environment, motivating companies, regions, and countries to innovate and improve. By setting benchmarks, it encourages continuous advancement and alignment with global transformation trends, particularly in industries like automotive that are experiencing rapid technological shifts.
6. **Stakeholder Communication and Transparency**: For external stakeholders, such as investors or development agencies, the score offers a transparent, quantifiable measure of readiness. This enhances trust, facilitates partnerships, and helps attract investment by clearly demonstrating the level of commitment to industry transformation.

2.5. Multiple Correspondence Analysis (MCA)

The MCA combines qualitative and quantitative data collection, leveraging a structured framework to assess key areas such as Automation, Electrification, Connectivity, and Platform Economy. The analysis aims to provide actionable insights into transformation readiness at both regional and company levels while ensuring comparability across diverse regions and stakeholders.

Multiple Correspondence analysis, the relationship between variables and their role in the automotive industry was examined from the point of view of various regional and corporate factors. Multiple Correspondence Analysis (MCA) was used for the analysis, which is a useful method for simplifying and

grouping multidimensional data. MCA allows large amounts of categorical (in this case, ordinal) variables to be plotted in a smaller-dimensional space, thus revealing the relationships and patterns between variables.[3]

2.5.1. What is Multiple Correspondence Analysis (MCA)?

MCA is a multidimensional scaling technique used to understand the relationships between categorical (and in our case, ordinal) variables. This is a generalized principal component analysis (PCA) procedure applied to multivariate categorical data. With MCA, we can create variable-representative dimensions that capture the most important relationship patterns between variables. The resulting dimensions allow you to visualize the similarities and differences between each category in a simple visual representation.

One of the main advantages of MCA is that it provides an easy and comprehensible representation of the relationships between different variables, thereby helping to identify variables that play a particularly important role in the development of a particular dimension. During the analysis, MCA was applied to various grouped variables (questions), such as 'Automation Factor' and 'Connectivity Factors'.

Core Methodology

The analysis is structured around the use of Multiple Correspondence Analysis (MCA) as the primary method for simplifying and visualizing multidimensional data. MCA allows for the transformation of categorical or ordinal survey responses into representative dimensions, which reveal relationships and patterns among variables. This methodology is particularly useful in identifying key factors that drive transformation readiness across thematic domains.

Data Categorization:

Survey questions are grouped into thematic domains, such as:

- Automation Factors
- Electrification Factors
- Connectivity Factors
- Platform Economy Factors

Each category is scored based on responses to a set of related questions (e.g., availability of skilled labor, infrastructure, education levels).

MCA Transformation Process:

Each survey response is transformed into a lower-dimensional space using MCA, which calculates weights and positions for each response.

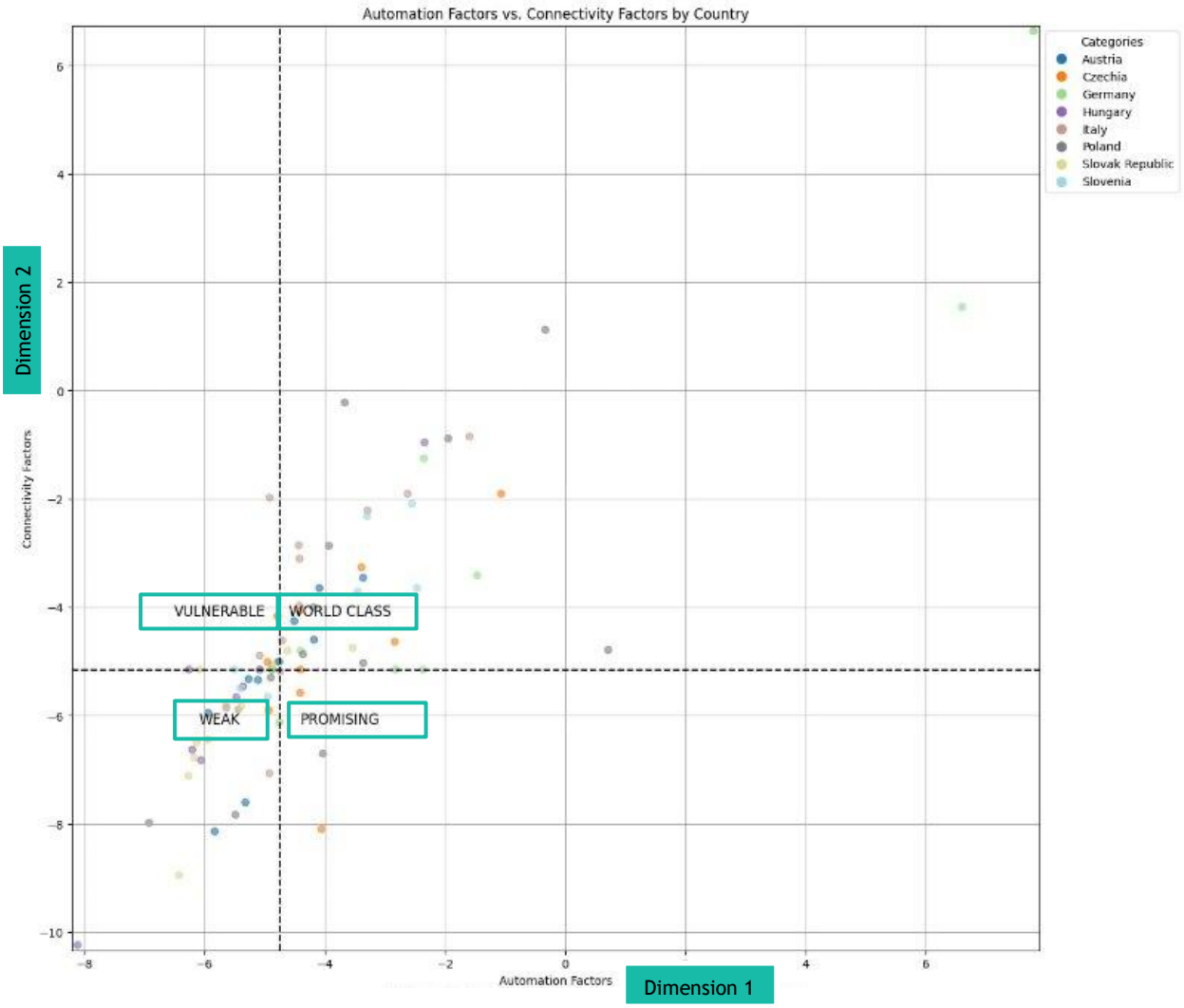
Example: A company's response to "Availability of skilled workforce" (scored from 1 to 5) is transformed into a normalized value, reflecting its importance relative to other responses in the dataset.

Visualization and Interpretation:

The analysis visualizes results on a two-dimensional plot, dividing companies into quadrants:

- Upper-right (World Class): High readiness in multiple dimensions.
- Lower-left (Weak): Low readiness across domains.
- Mixed Quadrants (Vulnerable & Promising): Strength in one domain but weaknesses in others.

[3] https://en.wikipedia.org/wiki/Multiple_correspondence_analysis



2.5.2. Workflow for Analysis

The following workflow illustrates how the analysis is implemented for each company and region:

Survey Completion: Companies respond to structured questions covering thematic areas such as Automation, Electrification, Connectivity, and Platform Economy.

Example Question: "Rate the availability of research institutions and technology parks in your region." (Scale: 1 = Poor to 5 = Outstanding)

MCA Transformation: Survey responses are converted into normalized values using MCA, reflecting their relative significance within the overall dataset.

Score Aggregation: Transformed scores are summed within each thematic area, producing an aggregate score for domains like Automation or Electrification.

Comparative Visualization: The aggregated scores are plotted on MCA dimensions, enabling comparison of a company's performance against peers and regional benchmarks.

Interpretation: Results are analyzed to identify strengths, weaknesses, and opportunities for improvement.

2.5.3. Statistical Validation and Example

To ensure the robustness of the findings, the analysis employs statistical tests to validate relationships between variables:

- Spearman's Rank Correlation: Evaluates correlations between continuous variables, such as workforce size and transformation readiness.
- Kruskal-Wallis Test: Compares medians across categorical variables, such as country-level differences.

These tests help identify significant trends and ensure that findings are statistically reliable.

Example of Question Grouping

Thematic areas are divided into specific categories, with each question contributing to a broader understanding of readiness. For example:

Automation Factors

Questions assess the availability of:

- Specialized education (technical schools, universities)
- Skilled workforce
- Research institutions
- Business support services (e.g., market intelligence, financial consulting)

Scoring:

Responses are scored from 1 (Poor) to 5 (Outstanding) and normalized via MCA to provide a relative ranking within the thematic area.

Key Insights

The analysis revealed several important trends:

Regional Influences: Readiness varies significantly by region, with countries like Germany showing strong performance across multiple domains.

Interconnected Factors: Strength in one domain (e.g., Connectivity) often reinforces readiness in others (e.g., Automation).

Critical Resources: Skilled labor, upskilling infrastructure, and specialized training facilities are primary drivers of transformation readiness, overshadowing traditional factors like patents or financial resources.

Limitations and Considerations

Users of this guideline should be aware of the following limitations:

Manual Weighting: While MCA simplifies data visualization, manual adjustments to weights may introduce subjectivity.

Missing Data: Median-based imputation for missing values can reduce sensitivity to regional or demographic differences.

Respondent Bias: Variability in survey responses based on the rank or role of respondents may affect the objectivity of results.

Conclusion

This structured analysis provides a standardized approach to assessing transformation readiness in the automotive sector. By integrating MCA, thematic question grouping, and statistical validation, the methodology enables regions and companies to benchmark their performance and identify areas for growth. While the approach is robust, careful consideration of its limitations ensures that results are interpreted accurately and used effectively for strategic decision-making.

3. Conclusion

In summary, following the project kick-off and exchanges, a shared understanding was established, and an EU questionnaire was developed. The questionnaire was reviewed with companies and BSOs in all regions. Companies either filled out the questionnaires themselves or were guided through them in meetings (online or offline).

It should be noted that the guided approach offers advantages and minimizes potential misunderstandings. The results were analyzed in detail, and their processing was largely automated. Key questions were grouped into categories, resulting in scores for 10 areas. These scores were combined into a Transformation Readiness Index, providing an initial assessment. With additional data in the following year(s), the score can be further refined and optimized.

A detailed analysis for the transnational report was conducted using the MCA methodology. Both methodologies, along with interviews and surveys in each region, provide an excellent foundation for the next project steps in WP1, 2, and 3. Based on this, scenarios can be developed, expert groups can begin their work, and conferences can be planned.

Appendix

Appendix 1: Catalogue of TRM catalogue of questions

Question Number	categories	Question Business	Question BSO
1.1	GENERAL	Entity location: city, region	Entity location: city, region
1.2	GENERAL	Entity location: EU member state	Entity location: EU member state
2.1	GENERAL	3. Entity's average turnover	4. Entity's average turnover
3.1	GENERAL	4. Entity's share of company sales in the automotive industry	
4.1	GENERAL	5. Number of employees	5. Number of employees
5.1	GENERAL	6. Average number of patent applications per year (2020-2024)	
6.1	GENERAL	7. Entity's class of economic activity (NACE code) Code 1:code	6. Entity's class of economic activit (NACE code) Code 1:NACE Code
7.1	GENERAL	7. Entity's class of economic activity (NACE code) Code 2:code	6. Entity's class of economic activit (NACE code) Code 2:NACE Code
8.1	GENERAL	7. Entity's class of economic activity (NACE code) Code 3:code	6. Entity's class of economic activit (NACE code) Code 3:NACE Code
			7. Entity service outreach
			8. Entity service description (main services provided for automotive companies)
9.1	GENERAL	9. Thematic focus area to which your current product portfolio is directed	9. Thematic focus area on which your current service portfolio is specialised:
10.1	10 RISKS	10. Taking into account your entity's current business model, in which of the below-mentioned areas risks endanger your entity's business continuity in the automotive sector in [1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme]:: Risks related to your current product portfolio	10. Taking into account companies from the automotive sector you are cooperating with, in which of the below-mentioned areas risks endanger those companies' business continuity in 2024-2030 [1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme]:: Risks related to the companies' current product portfolio
10.2	10 RISKS	10. Taking into account your entity's current business model, in which of the below-mentioned areas risks endanger your entity's business continuity in the automotive sector in [1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme]:: Risks related to your currently applied production technologies	10. Taking into account companies from the automotive sector you are cooperating with, in which of the below-mentioned areas risks endanger those companies' business continuity in 2024-2030 [1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme]:: Risks related to the companies' currently applied production technologies
10.3	10 RISKS	10. Taking into account your entity's current business model, in which of the below-mentioned areas risks endanger your entity's business continuity in the automotive sector in [1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme]:: Risks related to your currently possessed competencies among employees	10. Taking into account companies from the automotive sector you are cooperating with, in which of the below-mentioned areas risks endanger those companies' business continuity in 2024-2030 [1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme]:: Risks related to the companies' currently possessed competencies among employees
11.1	11 RISKS	11. Which are the main identified risk factors impacting your entity's business continuity in the automotive sector in 2024-2030?	11. According to your observations, which are the main identified risk factors impacting business continuity of companies from the automotive in 2024-2030? [multiple choice]:

12.1	12 PRESSURE	12. To ensure your entity's business continuity in the automotive sector in 2024-2030, how would you rate the level of pressure to provide change …? [1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme]:: In your current product portfolio	12. According to your observations, how would you rate the level of pressure to provide change experienced by companies from the automotive in order to ensure business continuity in 2024-2030? (1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme):: Changes related to the companies' current product portfolio
12.2	12 PRESSURE	12. To ensure your entity's business continuity in the automotive sector in 2024-2030, how would you rate the level of pressure to provide change …? [1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme]:: In your currently applied production technologies	12. According to your observations, how would you rate the level of pressure to provide change experienced by companies from the automotive in order to ensure business continuity in 2024-2030? (1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme):: Changes related to the companies' currently applied production technologies
12.3	12 PRESSURE	12. To ensure your entity's business continuity in the automotive sector in 2024-2030, how would you rate the level of pressure to provide change …? [1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme]:: In your currently possessed competencies among employees	12. According to your observations, how would you rate the level of pressure to provide change experienced by companies from the automotive in order to ensure business continuity in 2024-2030? (1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme):: Changes related to the companies' currently possessed competencies among employees
13.1	13 READINESS	13. To ensure your entity's business continuity in the automotive sector in 2024-2030, how would rate your entity's readiness to provide change in the short term? * [1 = not ready at all, 2= slightly ready, 3 = moderately ready, 4 = mostly ready, 5 = completely ready]:: In your current product portfolio	13. According to your observations, how would you rate the level of readiness to provide change in the short term by companies from the automotive? (1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme):: Changes related to the companies' current product portfolio
13.2	13 READINESS	13. To ensure your entity's business continuity in the automotive sector in 2024-2030, how would rate your entity's readiness to provide change in the short term? * [1 = not ready at all, 2= slightly ready, 3 = moderately ready, 4 = mostly ready, 5 = completely ready]:: In your currently applied production technologies	13. According to your observations, how would you rate the level of readiness to provide change in the short term by companies from the automotive? (1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme):: Changes related to the companies' currently applied production technologies
13.3	13 READINESS	13. To ensure your entity's business continuity in the automotive sector in 2024-2030, how would rate your entity's readiness to provide change in the short term? * [1 = not ready at all, 2= slightly ready, 3 = moderately ready, 4 = mostly ready, 5 = completely ready]:: In your currently possessed competencies among employees	13. According to your observations, how would you rate the level of readiness to provide change in the short term by companies from the automotive? (1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme):: Changes related to the companies' currently possessed competencies among employees
14.1	14 READINESS GAPS	14. Which are the main readiness gaps hindering your entity from starting a transformation process?	14. According to your observations, which are the main readiness gaps hindering companies from the automotive sector from starting a transformation process? [multiple-choice]

15.1	15 OPPORTUNITIES	15. To ensure your entity's business continuity in the automotive sector in 2024-2030 in which thematic area do you see opportunities for your entity [1 = negligible opportunities, 2= minor opportunities, 3 = moderate opportunities, 4 = major opportunities, 5 = extremely important opportunities)]: Electrification	15. In which thematic area do you see opportunities for companies from the automotive sector in your region in 2024-2030 (1 = negligible opportunities, 2= minor opportunities, 3 = moderate opportunities, 4 = major opportunities, 5 = extremely important opportunities): Electrification
15.2	15 OPPORTUNITIES	15. To ensure your entity's business continuity in the automotive sector in 2024-2030 in which thematic area do you see opportunities for your entity [1 = negligible opportunities, 2= minor opportunities, 3 = moderate opportunities, 4 = major opportunities, 5 = extremely important opportunities)]: Connectivity	15. In which thematic area do you see opportunities for companies from the automotive sector in your region in 2024-2030 (1 = negligible opportunities, 2= minor opportunities, 3 = moderate opportunities, 4 = major opportunities, 5 = extremely important opportunities): Connectivity
15.3	15 OPPORTUNITIES	15. To ensure your entity's business continuity in the automotive sector in 2024-2030 in which thematic area do you see opportunities for your entity [1 = negligible opportunities, 2= minor opportunities, 3 = moderate opportunities, 4 = major opportunities, 5 = extremely important opportunities)]: Automation	15. In which thematic area do you see opportunities for companies from the automotive sector in your region in 2024-2030 (1 = negligible opportunities, 2= minor opportunities, 3 = moderate opportunities, 4 = major opportunities, 5 = extremely important opportunities): Automation
15.4	15 OPPORTUNITIES	15. To ensure your entity's business continuity in the automotive sector in 2024-2030 in which thematic area do you see opportunities for your entity [1 = negligible opportunities, 2= minor opportunities, 3 = moderate opportunities, 4 = major opportunities, 5 = extremely important opportunities)]: Platform economy	15. In which thematic area do you see opportunities for companies from the automotive sector in your region in 2024-2030 (1 = negligible opportunities, 2= minor opportunities, 3 = moderate opportunities, 4 = major opportunities, 5 = extremely important opportunities): Platform economy
16.1	16 STRATEGIC APPROACHES	16. What kind of strategic approaches does your entity consider for the above-mentioned fields	16. According to your observations, what kind of strategic approaches do companies from the automotive sector in your region consider for the above-mentioned fields? [multiple-choice]
17.1	17 TECHNOLOGY - SKILLS GAPS	17. Are there any precise technology and/or skills gaps or other factors that you would like support in to increase your transformation readiness?	17. Are there any precise technology and/or skills gaps or other factors that you think companies in your region would need to increase the automotive transformation readiness?
18.1	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government policies - regulations supporting EV production	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government policies – regulations supporting EV production
18.2	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component

		production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government policies - regulations supporting EV market uptake	production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government policies – regulations supporting EV market uptake
18.3	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government financial incentives - subsidies, grants, tax breaks for production companies	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government financial incentives - subsidies, grants, tax breaks for production companies
18.4	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government financial incentives - subsidies, grants, tax breaks for EV market uptake	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government financial incentives - subsidies, grants, tax breaks for EV market uptake
18.5	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Industrial zones tailored for EV component manufacturing	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Industrial zones tailored for EV component manufacturing
18.6	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Transportation networks and logistics infrastructure for materials and finished goods to facilitate timely and cost-effective delivery	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Transportation networks and logistics infrastructure for materials and finished goods to facilitate timely and cost-effective delivery
18.7	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 =	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory,

		satisfactory, 4 = very satisfactory, 5 = outstanding]: Energy infrastructure	4 = very satisfactory, 5 = outstanding]: Energy infrastructure
18.8	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of skilled workforce	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of skilled workforce
18.9	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at technical school level	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at technical school level
18.10	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at university level	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at university level
18.11	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised training facilities to upskill/reskill employees	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised training facilities to upskill/reskill employees
18.12	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of research institutions, technology parks	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of research institutions, technology parks
18.13	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component

		production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of an ecosystem of specialised technology companies	production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of an ecosystem of specialised technology companies
18.14	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Proximity to suppliers	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Proximity to suppliers
18.15	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Proximity to OEMs	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Proximity to OEMs
18.16	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Regional/national market openness towards buying EV	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Regional/national market openness towards buying EV
18.17	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Local supplier network cooperation	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Local supplier network cooperation
18.18	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Access to business support services such as financial consulting, legal advice, and market intelligence tailored for EV component suppliers	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Access to business support services such as financial consulting, legal advice, and market intelligence tailored for EV component suppliers

18.19	18 ELECTRIFICATION REGIONAL FACTORS	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Access to specialised companies supporting waste reduction, energy efficiency, and carbon footprint reduction	18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of electrification (EV component production, EV production, EV maintenance, EV loading infrastructure) [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Access to specialised companies supporting waste reduction, energy efficiency, and carbon footprint reduction
19.1	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government policies - regulations supporting automation technologies production	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government policies – regulations supporting automation technologies production
19.2	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government financial incentives - subsidies, grants, tax breaks for production companies	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government financial incentives - subsidies, grants, tax breaks for production companies
19.3	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Industrial zones tailored for companies specialised in vehicle automation solutions	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Industrial zones tailored for companies specialised in vehicle automation solutions
19.4	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Transportation networks and logistics infrastructure for materials and finished goods to facilitate timely and cost-effective delivery	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Transportation networks and logistics infrastructure for materials and finished goods to facilitate timely and cost-effective delivery
19.5	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Energy infrastructure	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Energy infrastructure
19.6	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 =	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 =

		unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: IT infrastructure	unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: IT infrastructure
19.7	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of skilled workforce	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of skilled workforce
19.8	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at technical school level	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at technical school level
19.9	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at university level	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at university level
19.10	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised training facilities to upskill/reskill employees	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised training facilities to upskill/reskill employees
19.11	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of research institutions, technology parks	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of research institutions, technology parks
19.12	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of an ecosystem of specialised technology companies	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of an ecosystem of specialised technology companies
19.13	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Proximity to suppliers	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Proximity to suppliers
19.14	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role	19. Rate the availability of factors in your region that allow your region to play a role

		in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Proximity to OEMs	in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Proximity to OEMs
19.15	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Regional/national market openness towards driving autonomous vehicles	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Regional/national market openness towards driving autonomous vehicles
19.16	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Local supplier network cooperation	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Local supplier network cooperation
19.17	19 AUTOMATION REGIONAL	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Access to business support services such as financial consulting, legal advice, and market intelligence tailored for companies specialised in vehicle automation solutions	19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of automation [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Access to business support services such as financial consulting, legal advice, and market intelligence tailored for companies specialised in vehicle automation solutions
20.1	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government policies - regulations supporting vehicle connectivity, smart city, data exchange, cybersecurity	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government policies – regulations supporting vehicle connectivity, smart city, data exchange, cybersecurity
20.2	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government financial incentives - subsidies, grants, tax breaks for production companies	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government financial incentives - subsidies, grants, tax breaks for production companies
20.3	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Industrial zones tailored for companies specialised in vehicle connectivity solutions	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Industrial zones tailored for companies specialised in vehicle connectivity solutions
20.4	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role	20. Rate the availability of factors in your region that allow your region to play a role

		in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Transportation networks and logistics infrastructure for materials and finished goods to facilitate timely and cost-effective delivery	in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Transportation networks and logistics infrastructure for materials and finished goods to facilitate timely and cost-effective delivery
20.5	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Energy infrastructure	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Energy infrastructure
20.6	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: IT infrastructure	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: IT infrastructure
20.7	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of skilled workforce	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of skilled workforce
20.8	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at technical school level	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at technical school level
20.9	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at university level	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at university level
20.10	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised training facilities to upskill/reskill employees	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised training facilities to upskill/reskill employees
20.11	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very

		satisfactory, 5 = outstanding]: Availability of research institutions, technology parks	satisfactory, 5 = outstanding]: Availability of research institutions, technology parks
20.12	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of an ecosystem of specialised technology companies	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of an ecosystem of specialised technology companies
20.13	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Proximity to suppliers	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Proximity to suppliers
20.14	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Proximity to OEMs	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Proximity to OEMs
20.15	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Regional/national market openness towards vehicle connectivity, data-sharing	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Regional/national market openness towards vehicle connectivity, data-sharing
20.16	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Local supplier network cooperation	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Local supplier network cooperation
20.17	20 CONNECTIVITY REGIONAL	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Access to business support services such as financial consulting, legal advice, and market intelligence tailored for companies specialised in vehicle connectivity solutions	20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of connectivity [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Access to business support services such as financial consulting, legal advice, and market intelligence tailored for companies specialised in vehicle connectivity solutions
21.1	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government policies - regulations supporting innovative	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government

		mobility solutions, vehicle platform economy models	policies – regulations supporting automation technologies production
21.2	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government financial incentives - subsidies, grants, tax breaks for innovative mobility solutions, platform economy initiatives	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government financial incentives - subsidies, grants, tax breaks for production companies
21.3	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government financial incentives - subsidies, grants, tax breaks for people deciding to participate in vehicle sharing	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Government financial incentives - subsidies, grants, tax breaks for people deciding to participate in vehicle sharing
21.4	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Energy infrastructure	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Energy infrastructure
21.5	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Vehicle maintenance network	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Vehicle maintenance network
21.6	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: IT infrastructure	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: IT infrastructure
21.7	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of skilled workforce	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of skilled workforce
21.8	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at technical school level	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at technical school level

21.9	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at university level	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised education at university level
21.10	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised training facilities to upskill/reskill employees	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of specialised training facilities to upskill/reskill employees
21.11	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of research institutions, technology parks	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of research institutions, technology parks
21.12	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of an ecosystem of specialised technology companies	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Availability of an ecosystem of specialised technology companies
21.13	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Regional/national market openness towards vehicle platform economy models	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Regional/national market openness towards vehicle platform economy models
21.14	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Local supplier network cooperation	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Local supplier network cooperation
21.15	21 PLATFORM ECONOMY REGIONAL	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Access to business support services such as financial consulting, legal advice, and market intelligence tailored for companies specialised in vehicle platform economy models	21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 in the thematic area of platform economy [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Access to business support services such as financial consulting, legal advice, and market intelligence tailored for companies specialised in vehicle platform economy models

22.1	22 REGIONAL COMPETITIVENESS	22. Do you have any other general recommendations and/or comments that regions need to consider for regional competitiveness in automotive sector (e.g. actions from government)?	22. Do you have any other general recommendations and/or comments that regions need to consider for regional competitiveness in automotive sector (e.g. actions from government)?
23.1	23 SPECIALISATION ELECTRIFICATION	23. On a scale of 1 to 5 how would you rate your region's current specialisation level as an automotive hub in Europe in the following thematic areas [1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = outstanding]: Electrification	23. On a scale of 1 to 5 how would you rate your region's current specialisation level as an automotive hub in Europe in the following thematic areas (1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = outstanding): Electrification
23.2	23 SPECIALISATION CONNECTIVITY	23. On a scale of 1 to 5 how would you rate your region's current specialisation level as an automotive hub in Europe in the following thematic areas [1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = outstanding]: Connectivity	23. On a scale of 1 to 5 how would you rate your region's current specialisation level as an automotive hub in Europe in the following thematic areas (1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = outstanding): Connectivity
23.3	23 SPECIALISATION AUTOMATION	23. On a scale of 1 to 5 how would you rate your region's current specialisation level as an automotive hub in Europe in the following thematic areas [1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = outstanding]: Automation	23. On a scale of 1 to 5 how would you rate your region's current specialisation level as an automotive hub in Europe in the following thematic areas (1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = outstanding): Automation
23.4	23 SPECIALISATION PLATFORM ECONOMY	23. On a scale of 1 to 5 how would you rate your region's current specialisation level as an automotive hub in Europe in the following thematic areas [1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = outstanding]: Platform economy	23. On a scale of 1 to 5 how would you rate your region's current specialisation level as an automotive hub in Europe in the following thematic areas (1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = outstanding): Platform economy
24.1	24 PERSPECTIVES ELECTRIFICATION	24. On a scale of 1 to 5 how would you rate your region's development perspectives in 2024-2030 as an automotive hub in Europe in the following thematic areas [1 = none, 2 = decline, 3 = stagnation, 4 = growth, 5 = European leadership]: Electrification	24. On a scale of 1 to 5 how would you rate your region's development perspectives in 2024-2030 as an automotive hub in Europe in the following thematic areas * (1 = none, 2 = decline, 3 = stagnation, 4 = growth, 5 = European leadership): Electrification
24.2	24 PERSPECTIVES CONNECTIVITY	24. On a scale of 1 to 5 how would you rate your region's development perspectives in 2024-2030 as an automotive hub in Europe in the following thematic areas [1 = none, 2 = decline, 3 = stagnation, 4 = growth, 5 = European leadership]: Connectivity	24. On a scale of 1 to 5 how would you rate your region's development perspectives in 2024-2030 as an automotive hub in Europe in the following thematic areas * (1 = none, 2 = decline, 3 = stagnation, 4 = growth, 5 = European leadership): Connectivity
24.3	24 PERSPECTIVES AUTOMATION	24. On a scale of 1 to 5 how would you rate your region's development perspectives in 2024-2030 as an automotive hub in Europe in the following thematic areas [1 = none, 2 = decline, 3 = stagnation, 4 = growth, 5 = European leadership]: Automation	24. On a scale of 1 to 5 how would you rate your region's development perspectives in 2024-2030 as an automotive hub in Europe in the following thematic areas * (1 = none, 2 = decline, 3 = stagnation, 4 = growth, 5 = European leadership): Automation
24.4	24 PERSPECTIVES PLATFORM ECONOMY	24. On a scale of 1 to 5 how would you rate your region's development perspectives in 2024-2030 as an automotive hub in Europe in the following thematic areas [1 = none, 2 = decline, 3 = stagnation, 4 = growth, 5 = European leadership]: Platform economy	24. On a scale of 1 to 5 how would you rate your region's development perspectives in 2024-2030 as an automotive hub in Europe in the following thematic areas * (1 = none, 2 = decline, 3 = stagnation, 4 = growth, 5 = European leadership): Platform economy

25.1	25 OVERALL COMPANIES	25. According to your observations how would you rate the overall reactions of automotive companies in your region in view of ongoing changes in the European automotive sector in 2024-2030? * [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]: Small enterprises (of national origin)	25. According to your observations how would you rate the overall reactions of automotive companies in your region in view of ongoing changes in the European automotive sector in 2024-2030? [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]: Small enterprises (of national origin)
25.2	25 OVERALL COMPANIES	25. According to your observations how would you rate the overall reactions of automotive companies in your region in view of ongoing changes in the European automotive sector in 2024-2030? * [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]: Small enterprises (foreign capital)	25. According to your observations how would you rate the overall reactions of automotive companies in your region in view of ongoing changes in the European automotive sector in 2024-2030? [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]: Small enterprises (foreign capital)
25.3	25 OVERALL COMPANIES	25. According to your observations how would you rate the overall reactions of automotive companies in your region in view of ongoing changes in the European automotive sector in 2024-2030? * [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]: Medium enterprises (of national origin)	25. According to your observations how would you rate the overall reactions of automotive companies in your region in view of ongoing changes in the European automotive sector in 2024-2030? [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]: Medium enterprises (of national origin)
25.4	25 OVERALL COMPANIES	25. According to your observations how would you rate the overall reactions of automotive companies in your region in view of ongoing changes in the European automotive sector in 2024-2030? * [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]: Medium enterprises (foreign capital)	25. According to your observations how would you rate the overall reactions of automotive companies in your region in view of ongoing changes in the European automotive sector in 2024-2030? [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]: Medium enterprises (foreign capital)
25.5	25 OVERALL COMPANIES	25. According to your observations how would you rate the overall reactions of automotive companies in your region in view of ongoing changes in the European automotive sector in 2024-2030? * [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]: Large enterprises (of national origin)	25. According to your observations how would you rate the overall reactions of automotive companies in your region in view of ongoing changes in the European automotive sector in 2024-2030? [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]: Large enterprises (of national origin)
25.6	25 OVERALL COMPANIES	25. According to your observations how would you rate the overall reactions of automotive companies in your region in view of ongoing changes in the European automotive sector in 2024-2030? * [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]: Large enterprises (foreign capital)	25. According to your observations how would you rate the overall reactions of automotive companies in your region in view of ongoing changes in the European automotive sector in 2024-2030? [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]: Large enterprises (foreign capital)
26.1	26 OVERALL SERVICES	26. According to your observations how would you rate the overall services offered by the regional business support ecosystem (consultancy firms, legal firms, technology parks, research institutions, education and	26. According to your observations how would you rate the overall services offered by the regional business support ecosystem (consultancy firms, legal firms, technology parks, research institutions, education and

		training organisations, public business support organisations) to support transformation processes in the automotive sector in your region in the following thematic areas? * [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Electrification	training organisations, public business support organisations) to support transformation processes in the automotive sector in your region in the following thematic areas? * [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Electrification
26.2	26 OVERALL SERVICES	26. According to your observations how would you rate the overall services offered by the regional business support ecosystem (consultancy firms, legal firms, technology parks, research institutions, education and training organisations, public business support organisations) to support transformation processes in the automotive sector in your region in the following thematic areas? * [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Connectivity	26. According to your observations how would you rate the overall services offered by the regional business support ecosystem (consultancy firms, legal firms, technology parks, research institutions, education and training organisations, public business support organisations) to support transformation processes in the automotive sector in your region in the following thematic areas? * [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Connectivity
26.3	26 OVERALL SERVICES	26. According to your observations how would you rate the overall services offered by the regional business support ecosystem (consultancy firms, legal firms, technology parks, research institutions, education and training organisations, public business support organisations) to support transformation processes in the automotive sector in your region in the following thematic areas? * [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Automation	26. According to your observations how would you rate the overall services offered by the regional business support ecosystem (consultancy firms, legal firms, technology parks, research institutions, education and training organisations, public business support organisations) to support transformation processes in the automotive sector in your region in the following thematic areas? * [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Automation
26.4	26 OVERALL SERVICES	26. According to your observations how would you rate the overall services offered by the regional business support ecosystem (consultancy firms, legal firms, technology parks, research institutions, education and training organisations, public business support organisations) to support transformation processes in the automotive sector in your region in the following thematic areas? * [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Platform economy	26. According to your observations how would you rate the overall services offered by the regional business support ecosystem (consultancy firms, legal firms, technology parks, research institutions, education and training organisations, public business support organisations) to support transformation processes in the automotive sector in your region in the following thematic areas? * [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]: Platform economy
27.1	27 MISSING SERVICES	27. Which services are missing on regional level to support companies in the automotive sector in preparing and implementing transformation projects to ensure business continuity in 2024-2030?	27. Which services are missing on regional level to support companies in the automotive sector in preparing and implementing transformation projects to ensure business continuity in 2024-2030?
28.1	28 RECOMMENDATIONS	Should you have any other recommendations related to transformation processes of companies in the automotive sector in your region or feedback to the survey, please write them here.	Should you have any other recommendations related to transformation processes of companies in the automotive sector in your region or feedback to the survey, please write them here:

Appendix 2: EU survey example (Business survey)

Keep in mind, if we ask questions regarding you, we refer generally to your organisations point of view. Anyhow you can also bring in your individual thoughts. **Answers will only be published in cumulative way (anonymized) as Transformation Readiness analysis for the region.**

To allow a deeper analysis, we'd like to ask you first to provide some information about your organisation, second to assess transformation readiness regarding your entity and third regarding your region.

The survey will take approx. 50 min. Thanks for taking the time.

METADATA

* 1. Entitiy Name

* Entity location: city, region

* Entity location: EU member state

- AT - Austria
- BE - Belgium
- BG - Bulgaria
- HR - Croatia
- CY - Cyprus
- CZ - Czechia
- DK - Denmark
- EE - Estonia
- FI - Finland
- FR - France
- DE - Germany
- EL - Greece
- HU - Hungary
- IE - Ireland
- IT - Italy
- LV - Latvia
- LT - Lithuania
- LU - Luxembourg
- MT - Malta
- NL - Netherlands
- PL - Poland
- PT - Portugal
- RO - Romania
- SK - Slovak Republic
- SI - Slovenia

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- ES - Spain
- SE - Sweden

*3. Entity's average turnover
- <2.0 M €
- 2.0 – 9.9 M €
- 10.0 – 49.9 M €
- 50.0 – 99.9 M €
- >100.0 M €

*4. Entity's share of company sales in the automotive industry
- <20%
- 20-49.9%
- 50-79.9%
- >80%

*5. Number of employees
- <10 employees
- 10 – 49 employees
- 50 – 249 employees
- 250 – 2,999 employees
- >3,000 employees

6. Average number of patent applications per year (2020-2024)

7. Entity's class of economic activity (NACE code)
allow up to three codes; write number

	code
Code 1	
Code 2	
Code 3	

*8. Entity activity description (main segments, product portfolio, role in the value chain (Tier1,2,3, OEM, not applicable))

*9. Thematic focus area to which your **current** product portfolio is directed
- Electrification
- Connectivity
- Automation
- Platform economy
- Other

3

ASSESSMENT REGARDING YOUR ENTITY

Transformation pressure, risks and readiness

10. Taking into account your entity's current business model, in which of the below-mentioned areas **risks endanger your entity's business continuity** in the automotive sector in [1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme]:

	1	2	3	4	5
* Risks related to your current product portfolio	○	○	○	○	○
* Risks related to your currently applied production technologies	○	○	○	○	○
* Risks related to your currently possessed competencies among employees	○	○	○	○	○

* 11. Which are the **main identified risk factors** impacting your entity's business continuity in the automotive sector in 2024-2030?

- ☐ Staff shortage
- ☐ Lack of staff critical competencies
- ☐ Material costs
- ☐ Energy costs
- ☐ Staff costs
- ☐ Costs related to ensuring compliance with regulations
- ☐ Costs related to ensuring compliance with client requirements
- ☐ Severe price competition on the market
- ☐ Inadequate machine park and technologies
- ☐ Diminishing demand from current clients
- ☐ Lack of own capital
- ☐ Problems accessing capital markets and loans
- ☐ Other

12. To ensure your entity's business continuity in the automotive sector in 2024-2030, how would you rate the level of **pressure to provide change** …? [1 = negligible, 2= minor, 3 = moderate, 4 = major, 5 = extreme]:

	1	2	3	4	5
* In your current product portfolio	○	○	○	○	○
* In your currently applied production technologies	○	○	○	○	○
* In your currently possessed competencies among employees	○	○	○	○	○

13. To ensure your entity's business continuity in the automotive sector in 2024-2030, how would rate your entity's **readiness to provide change** in the short term? * [1 = not ready at all, 2= slightly ready, 3 = moderately ready, 4 = mostly ready, 5 = completely ready]:

4

	1	2	3	4	5
* In your current product portfolio	○	○	○	○	○
* In your currently applied production technologies	○	○	○	○	○
* In your currently possessed competencies among employees	○	○	○	○	○

* 14. Which are the **main readiness gaps** hindering your entity from starting a transformation process?

- ☐ Lack of a transformation strategy
- ☐ Lack of staff having appropriate competencies
- ☐ Lack of suppliers/partners having appropriate competencies/solutions
- ☐ Lack of financial means to finance transformation projects
- ☐ Lack of appropriate machines/production technologies
- ☐ Lack of space to provide transformation projects
- ☐ Other

Transformation opportunities and strategic approaches

15. To ensure your entity's business continuity in the automotive sector in 2024-2030 in which thematic area do you see **opportunities** for your entity [1 = negligible opportunities, 2= minor opportunities, 3 = moderate opportunities, 4 = major opportunities, 5 = extremely important opportunities)]

	1	2	3	4	5
* Electrification	○	○	○	○	○
* Connectivity	○	○	○	○	○
* Automation	○	○	○	○	○
* Platform economy	○	○	○	○	○

* 16. What kind of **strategic approaches** does your entity consider for the above-mentioned fields

- ☐ Horizontal diversification in the automotive industry (add new products or services that are related to your existing ones, but appeal to different clients or segments)
- ☐ Vertical diversification along the value chain (take up activities your suppliers or clients previously performed)
- ☐ Intensification of R&D in vehicle decarbonization technologies (components for electric, hybrid, hydrogen vehicles)
- ☐ Intensification of R&D in connectivity technologies (sensors, camera's, software, cybersecurity, infotainment)
- ☐ Intensification of R&D in automation technologies (software, decentralised motors, mini-computers, camera's, sensors, cybersecurity)
- ☐ Development of new business models for the platform economy
- ☐ Development / acquisition of new critical competencies
- ☐ Development of new products/services
- ☐ Intensification of intra-industry cooperation
- ☐ Intensification of cross-industry cooperation
- ☐ Other

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17. Are there any precise **technology and/or skills gaps** or other factors that you would like support in to increase your transformation readiness?

ASSESSMENT REGARDING THE REGION

Factors to play a role in automotive in 2024-2030

18. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 **in the thematic area of electrification** (EV component production, EV production, EV maintenance, EV loading infrastructure). [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]

Annex 1 Reference model: Find here more info on what is meant with electrification.

	1	2	3	4	5	unable to answer
* Government policies – regulations supporting EV production						
* Government policies – regulations supporting EV market uptake						
* Government financial incentives - subsidies, grants, tax breaks for production companies						
* Government financial incentives - subsidies, grants, tax breaks for EV market uptake						
* Industrial zones tailored for EV component manufacturing						
* Transportation networks and logistics infrastructure for materials and finished goods to facilitate timely and cost-effective delivery						
* Energy infrastructure						
* Availability of skilled workforce						
* Availability of specialised education at technical school level						
* Availability of specialised education at university level						
* Availability of specialised training facilities to upskill/reskill employees						
* Availability of research institutions, technology parks						
* Availability of an ecosystem of specialised technology companies						

6

• Proximity to suppliers	○	○	○	○	○	○
• Proximity to OEMs	○	○	○	○	○	○
• Regional/national market openness towards buying EV	○	○	○	○	○	○
• Local supplier network cooperation	○	○	○	○	○	○
• Access to business support services such as financial consulting, legal advice, and market intelligence tailored for EV component suppliers	○	○	○	○	○	○
• Access to specialised companies supporting waste reduction, energy efficiency, and carbon footprint reduction	○	○	○	○	○	○

19. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 **in the thematic area of automation** [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]

Annex 1 Reference model: Find here more info on what is meant with automation.

	1	2	3	4	5	unable to answer
• Government policies – regulations supporting automation technologies production	○	○	○	○	○	○
• Government financial incentives - subsidies, grants, tax breaks for production companies	○	○	○	○	○	○
• Industrial zones tailored for companies specialised in vehicle automation solutions	○	○	○	○	○	○
• Transportation networks and logistics infrastructure for materials and finished goods to facilitate timely and cost-effective delivery	○	○	○	○	○	○
• Energy infrastructure	○	○	○	○	○	○
• IT infrastructure	○	○	○	○	○	○
• Availability of skilled workforce	○	○	○	○	○	○
• Availability of specialised education at technical school level	○	○	○	○	○	○
• Availability of specialised education at university level	○	○	○	○	○	○
• Availability of specialised training facilities to upskill/reskill employees	○	○	○	○	○	○
• Availability of research institutions, technology parks	○	○	○	○	○	○
• Availability of an ecosystem of specialised technology companies	○	○	○	○	○	○
• Proximity to suppliers	○	○	○	○	○	○

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* Proximity to OEMs	○	○	○	○	○	○
* Regional/national market openness towards driving autonomous vehicles	○	○	○	○	○	○
* Local supplier network cooperation	○	○	○	○	○	○
* Access to business support services such as financial consulting, legal advice, and market intelligence tailored for companies specialised in vehicle automation solutions	○	○	○	○	○	○

20. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 **in the thematic area of connectivity** [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]

Annex 1 Reference model: Find here more info on what is meant with connectivity.

	1	2	3	4	5	unable to answer
* Government policies – regulations supporting vehicle connectivity, smart city, data exchange, cybersecurity	○	○	○	○	○	○
* Government financial incentives - subsidies, grants, tax breaks for production companies	○	○	○	○	○	○
* Industrial zones tailored for companies specialised in vehicle connectivity solutions	○	○	○	○	○	○
* Transportation networks and logistics infrastructure for materials and finished goods to facilitate timely and cost-effective delivery	○	○	○	○	○	○
* Energy infrastructure	○	○	○	○	○	○
* IT infrastructure	○	○	○	○	○	○
* Availability of skilled workforce	○	○	○	○	○	○
* Availability of specialised education at technical school level	○	○	○	○	○	○
* Availability of specialised education at university level	○	○	○	○	○	○
* Availability of specialised training facilities to upskill/reskill employees	○	○	○	○	○	○
* Availability of research institutions, technology parks	○	○	○	○	○	○
* Availability of an ecosystem of specialised technology companies	○	○	○	○	○	○
* Proximity to suppliers	○	○	○	○	○	○
* Proximity to OEMs	○	○	○	○	○	○
* Regional/national market openness towards vehicle connectivity, data-sharing	○	○	○	○	○	○

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• Local supplier network cooperation	○	○	○	○	○	○
• Access to business support services such as financial consulting, legal advice, and market intelligence tailored for companies specialised in vehicle connectivity solutions	○	○	○	○	○	○

21. Rate the availability of factors in your region that allow your region to play a role in automotive in 2024-2030 **in the thematic area of platform economy** [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]

Annex 1 Reference model: Find here more info on what is meant with platform economy.

	1	2	3	4	5	unable to answer
• Government policies – regulations supporting innovative mobility solutions, vehicle platform economy models	○	○	○	○	○	○
• Government financial incentives - subsidies, grants, tax breaks for innovative mobility solutions, platform economy initiatives	○	○	○	○	○	○
• Government financial incentives - subsidies, grants, tax breaks for people deciding to participate in vehicle sharing	○	○	○	○	○	○
• Energy infrastructure	○	○	○	○	○	○
• Vehicle maintenance network	○	○	○	○	○	○
• IT infrastructure	○	○	○	○	○	○
• Availability of skilled workforce	○	○	○	○	○	○
• Availability of specialised education at technical school level	○	○	○	○	○	○
• Availability of specialised education at university level	○	○	○	○	○	○
• Availability of specialised training facilities to upskill/reskill employees	○	○	○	○	○	○
• Availability of research institutions, technology parks	○	○	○	○	○	○
• Availability of an ecosystem of specialised technology companies	○	○	○	○	○	○
• Regional/national market openness towards vehicle platform economy models	○	○	○	○	○	○
• Local supplier network cooperation	○	○	○	○	○	○
• Access to business support services such as financial consulting, legal advice, and market intelligence tailored for companies specialised in vehicle platform economy models	○	○	○	○	○	○

22. Do you have any **other general recommendations and/or comments** that regions need to consider for regional competitiveness in automotive sector (e.g. actions from government)?

9

Transformation perspectives in 2024-2030

23. On a scale of 1 to 5 how would you rate your **region's current specialisation level** as an automotive hub in Europe in the following thematic areas [1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = outstanding]

	1	2	3	4	5
* Electrification					
* Connectivity					
* Automation					
* Platform economy					

24. On a scale of 1 to 5 how would you rate your **region's development perspectives** in 2024-2030 as an automotive hub in Europe in the following thematic areas [1 = none, 2 = decline, 3 = stagnation, 4 = growth, 5 = European leadership]

	1	2	3	4	5
* Electrification					
* Connectivity					
* Automation					
* Platform economy					

25. According to your observations how would you rate the **overall reactions of automotive companies** in your region in view of ongoing changes in the European automotive sector in 2024-2030? * [1 = closure, 2 = stagnation, 3 = diversification, 4 = moderate growth, 5 = significant growth]

definiton SME

	1	2	3	4	5
* Small enterprises (of national origin)					
* Small enterprises (foreign capital)					
* Medium enterprises (of national origin)					
* Medium enterprises (foreign capital)					
* Large enterprises (of national origin)					
* Large enterprises (foreign capital)					

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26. According to your observations how would you rate the **overall services offered by the regional business support ecosystem** (consultancy firms, legal firms, technology parks, research institutions, education and training organisations, public business support organisations) **to support transformation processes in the automotive sector** in your region in the following thematic areas? * [1 = poor, 2 = unsatisfactory, 3 = satisfactory, 4 = very satisfactory, 5 = outstanding]

	1	2	3	4	5
* Electrification	○	○	○	○	○
* Connectivity	○	○	○	○	○
* Automation	○	○	○	○	○
* Platform economy	○	○	○	○	○

27. **Which services are missing on regional level to support companies** in the automotive sector in preparing and implementing transformation projects to ensure business continuity in 2024-2030?

CLOSING

Should you have any other recommendations related to transformation processes of companies in the automotive sector in your region or feedback to the survey, please write them here.

Thank you for participating.

With your help, we can better understand and take advantage of the challenges and opportunities of transformation in automotive industry by analysing the status-quo of regional (innovation) ecosystems.

We would like to keep you informed of the results of this survey and upcoming activities of Drive2Transform. May we approach you for this? If yes, please write down your contact details:

	Details
Name	
Function	
E-Mail	

What's coming next in Drive2Transform?

- Development of potential transformation scenarios for businesses on **the short-, mid- and long-term** together with regional stakeholders. Stay tuned – we'll organise a regional workshop beginning 2025!

- Design and implementation of **Transformation Capacity Building Packages for (1) businesses, (2) business-support organisations, and (3) policy makers**. We will support you with awareness, learning and take-up activities including e.g. workshops, podcasts, trainings, webinars, study visits, and Central Europe Transformation Congresses.

- **Identification, adoption and exploitation of new value chains / innovative use cases** for the automotive industry in the four thematic areas: Electrification, Connectivity, Automation and Platform Economy.

- Establishment of an **active regional and Central European network** of businesses, especially SMEs, business support organisations, researchers, policy makers and other interested. Proactively engage in this network, **find new cooperation partners, business opportunities and increase your visibility**.

Follow us: website and LinkedIn!

Background Documents

D2T_A1.1_TRM_Annex2_Competitive_advantage_factors_for_automotive_regions.pdf

D2T_A1.1_TRM_Annex_1_Reference_Model.pdf

Contact

Contact Form

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Appendix 3: EU survey (Annex 1 Reference Model)

The below presented reference model for each of the four thematic areas gives an overview of main products (for connectivity and platform economy also services), critical production technologies and critical competencies.

Content

1. Electricifation

1.1. Products

- Powertrain Components: Electric Motors, Battery Packs, Power Electronics (Inverters, Converters), Onboard Chargers, Motor Controllers, Drive Units
- Battery System Components: Battery Cells, Battery Management Systems (BMS), Battery Thermal, Management Systems, Battery Modules, Battery Pack Enclosures
- Charging Components: Charging Ports, Charging Cables, DC Fast Chargers, Wireless Charging Systems, Home Charging Stations
- Control Systems: Vehicle Control Units (VCU), Autonomous Driving Systems, Advanced Driver, Assistance Systems (ADAS), Telematics Units, Human-Machine Interface (HMI) Systems
- Cooling and Heating Systems: Thermal Management Systems, Coolant Pumps, Heating, Ventilation, and Air Conditioning (HVAC) Systems, Heat Exchangers
- Transmission Components: Single-Speed Transmissions, Two-Speed Transmissions, Differentials
- Interior Components: Infotainment Systems, Digital Instrument Clusters, Seats and Upholstery, Interior Lighting, Dashboards
- Exterior Components: Body Panels, Lighting Systems (LED Headlights, Taillights), Windshields, Mirrors, Wipers
- Chassis and Suspension Components: Suspension Systems, Steering Systems, Braking Systems, Axles
- Safety Systems: Airbags, Crumple Zones, Reinforced Passenger Cells, Collision Detection Systems
- Wiring and Connectivity: High Voltage Wiring, Low Voltage Wiring, Connector Systems, Sensors
- Software Components: Battery Management Software, Motor Control Software, Vehicle Control Software, Navigation Systems, Over-the-Air (OTA) Update Systems
- Energy Recovery Systems: Regenerative Braking Systems, Energy Harvesting Systems
- Miscellaneous Components: Tires, Wheels, Fasteners, Insulation Materials

1.2. Critical production technologies

- Battery Production Technologies
  - Lithium-Ion Battery Manufacturing
    - Electrode Production: Coating, drying, calendaring, and slitting of electrodes.
    - Cell Assembly: Stacking or winding of electrodes, separator insertion, electrolyte filling.
    - Formation and Aging: Charging and discharging cycles to stabilize the battery.
    - Battery Module and Pack Assembly: Integrating cells into modules and packs, including welding and thermal management integration.
  - Solid-State Battery Manufacturing
    - Thin Film Deposition: Techniques such as sputtering and chemical vapor deposition (CVD) for creating solid electrolytes.
    - Lithium Metal Anode Processing: Specialized handling and assembly techniques.
- Electric Motor Production Technologies
  - Winding and Assembly
    - Wire Winding Machines: Automated machines for precise winding of motor coils.
    - Stator and Rotor Assembly: Precision assembly techniques to integrate windings into the motor structure.
    - Magnet Insertion: Automated insertion and bonding of permanent magnets into rotors.
  - Casting and Machining
    - High-Pressure Die Casting: For producing lightweight and complex aluminum motor housings.
    - CNC Machining: For precision manufacturing of motor components such as shafts and housings.

- Power Electronics Production Technologies
  - PCB Manufacturing
    - Surface Mount Technology (SMT): Automated placement and soldering of electronic components on printed circuit boards (PCBs).
    - Wave Soldering and Reflow Soldering: Techniques for soldering through-hole and surface-mounted components.
- Lightweight Materials and Structural Components
  - Composite Materials Manufacturing
    - Carbon Fiber Layup and Curing: Manual or automated layup of carbon fiber prepregs, followed by autoclave curing.
    - Resin Transfer Molding (RTM): Injecting resin into a mold containing a fiber preform.
  - Aluminum and High-Strength Steel Fabrication
    - Sheet Metal Stamping: Forming aluminum and high-strength steel sheets into body panels and structural components.
    - Laser Cutting and Welding: Precision cutting and welding for creating complex structures.
- Thermal Management System Production
  - Heat Exchanger Manufacturing
    - Brazing and Soldering: Techniques for assembling heat exchangers such as radiators and battery cooling plates.
    - Injection Molding: For producing plastic components used in thermal management systems.
- Advanced Manufacturing and Assembly Technologies
  - Additive Manufacturing (3D Printing)
    - Prototyping and Small Batch Production: Using 3D printing to create prototypes and low-volume production parts.
    - Metal Additive Manufacturing: Techniques like selective laser melting (SLM) for producing complex metal parts.
  - Robotics and Automation
    - Automated Assembly Lines: Utilizing robots for tasks such as welding, painting, and assembly to increase precision and efficiency.
    - Collaborative Robots (Cobots): Working alongside human operators to perform repetitive or dangerous tasks.
- Quality Control and Testing
  - Non-Destructive Testing (NDT)
    - X-Ray and Ultrasonic Testing: Inspecting internal structures without damaging components.
    - Thermography: Using thermal cameras to detect defects in electrical components.
  - Environmental and Stress Testing
    - Temperature and Humidity Chambers: Simulating extreme conditions to test the durability of components.
    - Vibration and Shock Testing: Ensuring components can withstand operational stresses.
- Software and Digital Technologies
  - Computer-Aided Design (CAD)
    - 3D Modeling and Simulation: Designing and simulating components before production.
  - Digital Twin Technology
    - Virtual Prototyping and Testing: Creating digital replicas of physical components for testing and optimization.

1.3. Critical competencies

- Battery Technology

  - Battery Cell Design and Manufacturing: Expertise in design and producing lithium-ion cells or solid-state batteries.
  - Battery Management Systems (BMS): Knowledge of BMS design and integration for optimal battery performance, monitoring and safety.
  - Energy Storage Solutions: Developing efficient and reliable energy storage systems for electric vehicles.
- Electric Powertrain
  - Electric Motor Design and Manufacturing: Skills to design and produce electric motors for various vehicle types.
  - Power Electronics: Skills for developing inverters, converters, and other electronics for efficient power management.
  - Drive Systems Integration: Skills to integrate motors, controllers, and transmissions for seamless power delivery.
- Vehicle Integration and Assembly
  - Vehicle Platform Design: Understanding of vehicle architectures optimized for electric powertrains and battery systems.
  - Assembly Line Expertise: Proficiency in establishing and optimizing production lines for electric vehicle assembly with high efficiency and quality control.
  - Integration of Advanced Systems: Ability to integrate complex systems like regenerative braking and thermal management.
- Advanced Materials and Lightweight Structures
  - Material Science: Knowledge of lightweight materials such as carbon fibre composites, high-strength alloys, and advanced polymers.
  - Structural Design: Skills in designing vehicle structures that optimize weight, safety, and aerodynamics.
  - Manufacturing Processes: Expertise in advanced manufacturing techniques like casting, forging, machining, and additive manufacturing for complex components.
- Safety and Regulatory Compliance
  - Safety Engineering: Understanding and implementation of safety standards specific to electric vehicles.
  - Regulatory Knowledge: Staying updated with global regulations related to electric vehicle components and systems.
  - Testing and Validation: Experience in conducting rigorous testing and validation to ensure compliance with safety and performance standards.
- Software and Connectivity
  - Embedded Systems: Ability to develop embedded software for vehicle control units (VCUs), BMS, and other electric vehicle systems.
  - Connectivity Solutions: Integrating IoT technologies for vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication.
  - Cybersecurity: Implementing cybersecurity measures to protect vehicle data and systems from cyber threats.
- Advanced Manufacturing Capabilities
  - Precision Engineering: Utilizing advanced manufacturing techniques for high-precision components.
  - Lean Manufacturing: Implementing efficient production processes to reduce waste and optimize throughput.
  - Automation and Robotics: Integrating automated systems for consistent quality and increased production efficiency.
- Quality Control and Assurance
  - ISO Standards Compliance: Meeting international quality standards.
  - Testing and Validation: Conducting rigorous testing for reliability, durability, and safety.
  - Supplier Quality Management: Implementing processes to ensure consistent quality across the supply chain.

- Regulatory and Compliance Knowledge
  - Safety Standards: Understanding and complying with automotive safety regulations.
  - Environmental Regulations: Adhering to regulations governing materials and manufacturing processes (e.g., REACH, RoHS).
  - Cybersecurity Standards: Implementing measures to protect electronic components from cyber threats.
- Environmental and Sustainability Practices
  - Green Manufacturing: Implementing eco-friendly manufacturing processes and reducing environmental impact.
  - Recycling and Waste Management: Developing strategies for recycling materials and reducing waste.
  - Lifecycle Assessment: Analysing environmental impacts throughout the product lifecycle.

2. Automation

2.1. Products

- Sensing Components: Lidar Sensors, Radar Sensors, Ultrasonic Sensors, Cameras (Surround View, Front, Rear, Side), Infrared Sensors
- Computing and Processing Units: Central Processing Units (CPUs), Graphics Processing Units (GPUs), Neural Network Accelerators, Field-Programmable Gate Arrays (FPGAs), Microcontrollers
- Control Systems: Autonomous Vehicle Control Units (AVCU), Vehicle Control Units (VCU), Electronic Control Units (ECU), Drive-by-Wire Systems, Steer-by-Wire Systems, Brake-by-Wire Systems
- Software and Algorithms: Sensor Fusion Software, Path Planning Algorithms, Machine Learning Models, Object Recognition Software, Localization and Mapping Software, Motion Control Algorithms
- Communication Systems: Vehicle-to-Vehicle (V2V) Communication Systems, Vehicle-to-Infrastructure (V2I) Communication Systems, Vehicle-to-Everything (V2X) Communication Systems, Telematics Units, 5G Modules
- Human-Machine Interface (HMI): Digital Instrument Clusters, Touchscreen Displays, Voice Control Systems, Haptic Feedback Systems, Heads-Up Displays (HUD)
- Power Supply Components: Battery Packs, Power Distribution Units (PDU), Inverters and Converters, Uninterruptible Power Supply (UPS) Systems
- Actuators and Mechanics: Electric Actuators, Hydraulic Actuators, Motors for Steering and Braking, Adaptive Suspension Systems
- Safety Systems: Redundant Systems for Critical Functions, Fail-Safe Mechanisms, Emergency Stop Systems, Collision Avoidance Systems, Crumple Zones and Reinforced Structures
- Navigation and Localization: Global Positioning Systems (GPS), Inertial Measurement Units (IMU), High-Definition Maps (HD Maps), Real-Time Kinematic (RTK) Positioning Systems
- Data Storage and Management: Solid-State Drives (SSDs), Data Loggers, Cloud Storage Solutions, Edge Computing Devices
- Testing and Validation Equipment: Simulation Software, Testing Rigs and Benches, Real-World Testing Environments, Data Annotation Tools
- Interior and Comfort Components: Adjustable Seats with Memory, Climate Control Systems, Interior Lighting, Advanced Audio Systems, Passenger Entertainment Systems
- Exterior Components: Body Panels with Integrated Sensors, Adaptive Headlights, Aerodynamic Elements, Signal and Indicator Lights, Smart Mirrors
- Energy Management Systems: Regenerative Braking Systems, Energy Harvesting Systems, Battery Management Systems (BMS)
- Miscellaneous Components: Tires with Integrated Sensors, Specialized Fasteners, Insulation Materials, Noise Reduction Components

2.2. Critical production technologies

- Sensor Technologies
  - Lidar Sensors
    - Optical Components Manufacturing: Precision optics manufacturing including lenses and mirrors.
    - Sensor Integration: Assembly of laser emitters, detectors, and signal processing electronics.
  - Radar and Ultrasonic Sensors
    - Antenna Design and Manufacturing: High-frequency antenna design and fabrication.
    - Signal Processing Electronics: PCB assembly for radar and ultrasonic signal processing.
  - Camera Systems
    - Lens Manufacturing: Precision lens grinding and polishing.
    - Image Sensor Integration: Mounting and calibration of image sensors onto PCBs.
- Computing and Processing Units
  - Central Processing Units (CPUs)
    - Semiconductor Fabrication: Cleanroom processes like lithography, etching, and doping for CPU chips.
    - Packaging and Testing: Assembling and testing of CPUs into integrated circuits.
  - Graphics Processing Units (GPUs)
    - High-Performance Computing: Manufacturing GPUs for parallel processing tasks.
    - Graphics Card Assembly: Mounting GPUs onto PCBs and heat sink integration.
  - Neural Network Accelerators
    - ASIC (Application-Specific Integrated Circuit) Design: Customized chips optimized for neural network operations.
    - FPGA (Field-Programmable Gate Array) Development: Configurable logic for accelerated computing.
- Control Systems
  - Vehicle Control Units (VCUs)
    - Electronic Control Module (ECM) Production: Manufacturing ECUs for vehicle control and communication.
    - Software Integration: Programming and testing control algorithms.
  - Drive-by-Wire Systems
    - Electronic Actuator Manufacturing: Production of actuators for brake-by-wire and steer-by-wire systems.
    - Sensor Integration: Integration of position sensors and feedback systems.
- Software and Algorithms
  - Sensor Fusion Software
    - Algorithm Development: Software for integrating data from multiple sensors.
    - Machine Learning Models: Training and deployment of AI models for object recognition and decision-making.
  - Path Planning and Navigation Algorithms
    - Algorithm Optimization: Real-time route planning and obstacle avoidance algorithms.
    - Simulations and Testing: Virtual testing environments for algorithm validation.
- Communication Systems
  - Vehicle-to-Vehicle (V2V) Communication
    - Wireless Communication Protocols: Development of protocols for vehicle communication.
    - Antenna Design: Design and testing of antennas for reliable V2V communication.
  - Vehicle-to-Infrastructure (V2I) Communication
    - Network Infrastructure: Development of infrastructure for roadside units.
    - Data Transmission Protocols: Secure protocols for vehicle-to-cloud communication.
- Safety Systems

    - Advanced Driver Assistance Systems (ADAS)
        - Sensor Integration: Integration of sensors for adaptive cruise control and lane departure warning systems.
        - Safety-Critical Software Development: Development and validation of software for collision avoidance.
    - Collision Detection Systems
        - Sensor Fusion Algorithms: Algorithms for integrating data from lidar, radar, and cameras.
        - Emergency Response Systems: Integration of collision detection with autonomous braking systems.
- Testing and Validation
    - Simulated Environments
        - Virtual Testing Platforms: Simulations of various driving scenarios and environmental conditions.
        - Hardware-in-the-Loop (HIL) Testing: Integration testing of hardware components in simulated environments.
    - Real-World Testing
        - Prototype Testing: Testing autonomous vehicles on closed tracks and public roads.
        - Data Collection and Analysis: Analyzing real-world performance data to refine algorithms.
- Manufacturing and Assembly Technologies
    - Additive Manufacturing (3D Printing)
        - Rapid Prototyping: Quick iteration of design concepts for sensors and enclosures.
        - Customized Component Production: Manufacturing complex parts for prototypes and low-volume production.
    - Robotics and Automation
        - Assembly Line Robotics: Automated assembly of electronic components and subsystems.
        - Quality Control Systems: Automated inspection of sensor accuracy and performance.
- Cybersecurity and Data Privacy
    - Secure Software Development
        - Encryption and Authentication: Secure communication protocols for protecting vehicle data.
        - Intrusion Detection Systems: Monitoring for unauthorized access and potential cyber threats.

2.3. Critical competencies

- Advanced Sensor Technology
    - Lidar Sensors: Expertise in designing and manufacturing high-precision lidar sensors for 3D mapping and object detection.
    - Radar and Ultrasonic Sensors: Expertise in developing sensors for accurate distance measurement and object detection in various weather conditions.
    - Camera Systems: Expertise in designing high-resolution cameras and image processing algorithms for visual recognition and perception.
- Embedded Systems and Electronics
    - Electronic Control Units (ECUs): Design, developing and producing ECUs for real-time processing and control of vehicle functions.
    - Drive-by-Wire Systems: Designing and implementing electronic systems for brake-by-wire and steer-by-wire functionalities.
    - Navigation and Positioning Systems: Integrating GPS, inertial measurement units (IMUs), and other positioning technologies for precise localization.
- Software Development

  - Embedded Software: Developing real-time software for autonomous driving functionalities, including perception, localization, and decision-making.
  - Simulation and Testing: Using simulation tools for testing and validating autonomous driving algorithms and systems.
  - OTA Updates: Implementing over-the-air update capabilities for continuous improvement and maintenance of autonomous systems.
- Artificial Intelligence and Machine Learning
  - Algorithm Development: Creating algorithms for sensor fusion, object recognition, path planning, and decision-making.
  - Machine Learning Models: Expertise in training models for behaviour prediction, anomaly detection, and adaptive control systems.
  - Edge Computing: Implementing AI and machine learning capabilities directly within embedded systems for real-time processing.
  - Deep Learning: Knowledge of deep neural networks and their applications in autonomous driving systems.
- Safety and Functional Safety
  - Functional Safety Standards: Understanding and implementing safety requirements for autonomous vehicle components.
  - Failure Mode and Effects Analysis (FMEA): Ability to conduct risk assessments and implement safety measures to ensure safe autonomous operations.
  - Safety-Critical Design: Designing components with redundancy and fail-safe mechanisms to ensure safe operation.
- Cybersecurity
  - Secure Communication Protocols: Implementing secure communication protocols for vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication.
  - Intrusion Detection Systems: Detecting and mitigating cybersecurity threats to vehicle systems and data.
  - Secure Software Development: Developing secure software and firmware updates to prevent unauthorized access.
- System Integration
  - Integration of Complex Systems: Experience in integrating sensors, ECUs, actuators, and communication systems into a cohesive autonomous driving system.
  - Validation and Verification: Conducting thorough testing and validation to ensure system performance and safety compliance.
  - Hardware-in-the-Loop (HIL) Testing: Utilizing HIL testing for real-world simulation of autonomous vehicle operations.
- Simulation and Testing
  - Virtual Testing Environments: Creating virtual simulations for testing autonomous driving algorithms and systems.
  - Hardware-in-the-Loop (HIL) Testing: Integrating components into simulated environments for real-world scenario testing.
  - Field Testing and Validation: Conducting extensive testing in controlled environments and on public roads to validate system performance.
- Design for Manufacturing (DFM)
  - Optimized Design: Designing components for manufacturability and scalability.
  - Material Selection: Selecting materials that balance performance, durability, and cost-effectiveness.
  - Advanced Manufacturing Techniques: Utilizing additive manufacturing, precision machining, and automation for high-quality production.
- Project Management
  - Project Planning and Execution: Skills in planning, coordinating, and managing projects related to autonomous vehicle component development.

  - Cross-functional Collaboration: Ability to collaborate with teams across engineering, production, quality assurance, and regulatory compliance.
  - Risk Management: Identifying and mitigating risks associated with project timelines, resource allocation, and technical challenges.
- Regulatory Compliance
  - Automotive Standards and Regulations: Ensuring compliance with automotive industry standards and regulations governing autonomous vehicle technologies.
  - Certification Processes: Managing the certification process for autonomous vehicle components and systems.

3. Connectivity

3.1. Products

- Communication Systems: Vehicle-to-Vehicle (V2V) Communication Systems, Vehicle-to-Infrastructure (V2I) Communication Systems, Vehicle-to-Everything (V2X) Communication Systems, Dedicated Short-Range Communication (DSRC) Modules, 5G Connectivity Modules, Telematics Control Units (TCU)
- Data Processing and Storage: Central Processing Units (CPUs), Graphics Processing Units (GPUs), Edge Computing Devices, Cloud Storage Solutions, Onboard Data Storage (SSDs, HDDs), Data Loggers
- Sensors and Actuators: Lidar Sensors, Radar Sensors, Ultrasonic Sensors, Cameras (Front, Rear, Surround View), Environmental Sensors (Temperature, Humidity), Electric Actuators
- Control Systems: Vehicle Control Units (VCU), Electronic Control Units (ECU), Powertrain Control Modules (PCM), Body Control Modules (BCM)
- Human-Machine Interface (HMI): Touchscreen Displays, Digital Instrument Clusters, Voice Recognition Systems, Heads-Up Displays (HUD), Haptic Feedback Systems
- Navigation and Localization: Global Positioning Systems (GPS), Inertial Measurement Units (IMU), Real-Time Kinematic (RTK) Positioning Systems, High-Definition Maps (HD Maps)
- Infotainment Systems: Multimedia Systems, Advanced Audio Systems, Connectivity Ports (USB, HDMI), Wireless Connectivity (Bluetooth, Wi-Fi), Rear-Seat Entertainment Systems
- Security Systems: Cybersecurity Modules, Encryption Hardware and Software, Biometric Authentication Systems, Vehicle Access Control Systems
- Remote Services and Management: Remote Diagnostic Systems, Over-the-Air (OTA) Update Systems, Fleet Management Systems, Remote Lock and Unlock Systems
- Safety Systems: Advanced Driver Assistance Systems (ADAS), Collision Avoidance Systems, Automatic Emergency Braking (AEB), Lane Keeping Assist Systems, Blind Spot Detection Systems
- Energy Management Systems: Battery Management Systems (BMS), Energy Harvesting Systems, Regenerative Braking Systems
- Charging Systems: Smart Charging Ports, Wireless Charging Systems, Home Charging Stations, Public Charging Infrastructure
- Environmental Monitoring: Air Quality Sensors, Weather Monitoring Systems, Tire Pressure Monitoring Systems (TPMS)
- Interior Comfort and Convenience: Climate Control Systems, Adjustable and Heated Seats, Ambient Lighting, Power Windows and Locks, Sunroof and Moonroof Controls
- Exterior Components: Adaptive Headlights, Signal and Indicator Lights, Smart Mirrors, Windshield Wipers with Sensors, Aerodynamic Components
- Software and Applications: Navigation Software, Entertainment Apps, Vehicle Health Monitoring Apps, Mobile Connectivity Apps, Driver Behavior Analysis Software
- Miscellaneous Components: Smart Tires, Insulation Materials, Fasteners and Connectors, Noise Reduction Components

3.2. Services

- Remote Diagnostics and Maintenance: Remote Vehicle Diagnostics, Predictive Maintenance Alerts, Software and Firmware Over-the-Air (OTA) Updates, Remote Vehicle Monitoring, Service Scheduling and Reminders
- Navigation and Traffic Management: Real-Time Traffic Updates, Turn-by-Turn Navigation, Dynamic Route Planning, Integrated Traffic Management Systems, Hazard and Accident Alerts
- Infotainment and Connectivity: Streaming Media Services, In-Car Internet Access, App Integration (Music, Podcasts, News), Social Media Access, Voice-Activated Assistants
- Safety and Security: Emergency Response Services (eCall), Stolen Vehicle Tracking and Recovery, Remote Lock/Unlock, Driver Behaviour Monitoring, Collision Detection and Reporting
- Vehicle-to-Everything (V2X) Communication: Vehicle-to-Vehicle (V2V) Communication, Vehicle-to-Infrastructure (V2I) Communication, Vehicle-to-Pedestrian (V2P) Communication, Vehicle-to-Network (V2N) Communication, Cooperative Adaptive Cruise Control (CACC)
- Fleet Management: Real-Time Fleet Tracking, Fuel Consumption Monitoring, Driver Performance Analysis, Maintenance Scheduling, Route Optimization
- Energy Management: Smart Charging Services, Energy Consumption Monitoring, Battery Health Management, Vehicle-to-Grid (V2G) Services, Renewable Energy Integration
- Insurance and Financial Services: Usage-Based Insurance (UBI), Pay-As-You-Drive (PAYD) Insurance, Claims Management, In-Vehicle Payment Services, Financing and Leasing Management
- Personalization and User Experience: Personalized In-Car Settings (Seats, Climate, Audio), Profile-Based Preferences, Customizable Dashboards, User Behaviour Analysis, Context-Aware Recommendations
- Data Services and Analytics: Telematics Data Collection, Big Data Analytics, Cloud-Based Data Storage, Driver Analytics and Reports, Vehicle Health Reports
- Autonomous Driving Support: High-Definition Map Updates, Remote Assistance for Autonomous Vehicles, Fleet Coordination for Autonomous Vehicles, Autonomous Driving Performance Monitoring, Safe Zone Identification
- Environmental Monitoring: Real-Time Weather Updates, Air Quality Monitoring, Environmental Hazard Alerts, Eco-Driving Assistance, Emissions Monitoring
- Retail and Commerce: In-Vehicle Shopping and Delivery Services, Location-Based Offers and Discounts, Digital Advertising, Parking Reservations and Payments, Fuel and Charging Station Locators
- Mobility Services: Ride-Hailing and Ride-Sharing Integration, Car Sharing Services, Public Transportation Integration, Multi-Modal Trip Planning, Micro-Mobility Services (eScooters, Bikes)
- Advanced Driver Assistance Systems (ADAS): Lane Keeping Assistance, Adaptive Cruise Control, Automatic Emergency Braking, Blind Spot Detection, Parking Assistance
- User Training and Support: Driver Education and Training Programs, Customer Support Services, In-App Tutorials and Guidance, Virtual Assistance
- Regulatory Compliance and Reporting: Regulatory Compliance Monitoring, Automated Reporting Services, Compliance with Emissions Standards, Safety Standards Adherence

3.3. Critical production technologies

- Communication Systems
  - Wireless Connectivity Modules
    - RF (Radio Frequency) Technology: Design and production of antennas and RF circuits.
    - Bluetooth, Wi-Fi, Cellular (5G, LTE): Integration of wireless communication standards.
  - Telematics Control Units (TCUs)
    - Embedded Systems Development: Software and hardware integration for vehicle connectivity.
    - SIM Card Integration: Provisioning and management of SIM cards for cellular connectivity.
- Data Processing and Storage
  - Central Processing Units (CPUs)

        - High-Performance Computing: Development and manufacturing of processors for onboard data processing.
        - AI and Machine Learning Accelerators: Hardware for real-time data analytics and decision-making.
    - Storage Solutions
        - Solid-State Drives (SSDs): High-speed data storage for vehicle telemetry and media.
        - Embedded Flash Memory: Storage solutions for firmware and software updates.
- Sensors and Actuators
    - Environmental Sensors
        - Temperature, Humidity Sensors: Manufacturing of sensors for climate control and cabin comfort.
        - Gas Sensors: Detection of pollutants and air quality monitoring.
    - Positioning and Navigation Systems
        - Global Navigation Satellite Systems (GNSS): Integration of GPS, Galileo, and other positioning technologies.
        - Inertial Measurement Units (IMUs): Sensors for vehicle orientation and movement.
- Control Systems
    - Electronic Control Units (ECUs)
        - Powertrain Control Modules (PCMs): Control units for electric and hybrid vehicle propulsion systems.
        - Body Control Modules (BCMs): Integration of electronic systems for vehicle functions.
    - Vehicle-to-Everything (V2X) Communication
        - Dedicated Short-Range Communication (DSRC): Technologies for vehicle-to-vehicle and vehicle-to-infrastructure communication.
        - 5G Connectivity: Infrastructure and hardware for high-speed cellular communication.
- Infotainment Systems
    - Multimedia Interfaces
        - Touchscreen Displays: Manufacturing of high-resolution displays for user interfaces.
        - Audio Systems: Integration of speakers and amplifiers for in-car entertainment.
    - Connectivity Ports
        - USB, HDMI Ports: Integration of ports for connecting external devices and media.
- Security Systems
    - Cybersecurity Modules
        - Secure Boot and Authentication: Hardware and software solutions for protecting vehicle data and systems.
        - Encryption Technologies: Data encryption techniques for secure communication channels.
    - Vehicle Access Control
        - Keyless Entry Systems: Integration of smart key systems and biometric authentication.
        - Remote Lock/Unlock Features: Connectivity solutions for remote vehicle access.
- Remote Services and Management
    - Over-the-Air (OTA) Updates
        - OTA Software Platforms: Infrastructure for remotely updating vehicle software and firmware.
        - Fleet Management Systems: Tools for monitoring and managing connected vehicle fleets.
    - Remote Diagnostics
        - Telematics Solutions: Data collection and analysis for proactive vehicle maintenance.
        - Remote Monitoring Systems: Real-time monitoring of vehicle health and performance.
- Safety Systems
    - Advanced Driver Assistance Systems (ADAS)
        - Collision Avoidance Systems: Sensors and algorithms for detecting and mitigating collision risks.

        - Lane Keeping Assist Systems: Technologies for assisting drivers in maintaining lane position.
    - Emergency Services
        - Automatic Emergency Braking (AEB): Systems for automatically applying brakes in emergency situations.
        - Emergency Call (eCall) Systems: Integration with emergency services for rapid response.
- Energy Management Systems
    - Battery Management Systems (BMS)
        - Battery Monitoring and Control: Hardware and software for managing battery performance and safety.
        - Charging Infrastructure: Solutions for managing electric vehicle charging networks.
- Environmental Monitoring
    - Air Quality Sensors
        - Pollution Detection: Sensors for monitoring air quality inside and outside the vehicle.
        - Weather Sensors: Integration of sensors for monitoring weather conditions.
- Software and Applications
    - Navigation Software
        - Map Data Integration: Technologies for integrating and updating high-definition map data.
        - Real-Time Traffic Information: Systems for providing drivers with up-to-date traffic conditions.
    - Entertainment Apps
        - Streaming Services Integration: Integration of streaming media services for in-car entertainment.
        - Smartphone Integration: Connectivity solutions for seamless integration with mobile devices.
- User Experience and Interface
    - Human-Machine Interface (HMI)
        - Voice Recognition Systems: Integration of voice-activated commands for hands-free operation.
        - Gesture Control: Technologies for controlling vehicle functions through gestures.
    - Personalization
        - Driver Profiles: Customizable settings for multiple drivers.
        - Context-Aware Systems: Adaptive systems that adjust based on driver preferences and conditions.

3.4. Main competencies

- Technical Expertise
    - Electronics Engineering: Understanding of electronics principles and circuits relevant to connected car components.
    - Software Development: Proficiency in embedded software development for ECUs, connectivity modules, and IoT devices.
    - Wireless Communication: Knowledge of RF technologies, Bluetooth, Wi-Fi, and cellular networks used in automotive applications.
    - Sensor Integration: Skills in integrating sensors for environmental monitoring, vehicle diagnostics, and advanced driver assistance systems (ADAS).
- Wireless Connectivity
    - RF (Radio Frequency) Technologies: Designing and manufacturing antennas, RF modules, and wireless communication components.
    - Bluetooth, Wi-Fi, Cellular (5G, LTE): Integration of wireless communication standards for vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication.
    - Telematics Control Units (TCUs): Developing hardware and software for integrated connectivity solutions.

- Embedded Systems and Electronics
  - Electronic Control Units (ECUs): Designing ECUs for managing connected vehicle systems and data.
  - Microcontrollers and Processors: Integration of processors capable of handling real-time data processing and communications.
  - Sensor Integration: Incorporating sensors for environmental monitoring and vehicle diagnostics.
- System Integration
  - Embedded Systems Integration: Experience in integrating hardware and software components into embedded systems for seamless operation.
  - Cloud Integration: Familiarity with cloud computing platforms and APIs for data storage, processing, and remote access.
  - OTA Updates: Skills in implementing over-the-air (OTA) update mechanisms for software and firmware updates in connected vehicles.
- Data Processing and Analytics
  - Big Data Analytics: Developing capabilities for processing and analyzing large volumes of vehicle data.
  - Cloud Computing: Implementing cloud-based solutions for data storage, processing, and remote access.
  - Edge Computing: Deploying computing capabilities at the edge for real-time data processing and decision-making.
- Cybersecurity
  - Secure Communication Protocols: Implementing protocols to secure vehicle-to-cloud and vehicle-to-vehicle communications.
  - Intrusion Detection Systems: Detecting and mitigating cybersecurity threats targeting connected car systems.
  - Data Encryption: Encrypting data to protect against unauthorized access and data breaches.
  - Network Security: Understanding of cybersecurity principles and protocols for securing vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications.
  - Data Privacy: Knowledge of data encryption methods and regulations (e.g., GDPR, CCPA) related to connected car data privacy.
  - Threat Detection and Response: Ability to identify and mitigate cybersecurity threats targeting connected car systems.
- Software Development
  - Embedded Software: Developing firmware and software for connected car functionalities.
  - OTA (Over-the-Air) Updates: Implementing solutions for remote software updates and patches.
  - Mobile Apps Integration: Integrating mobile applications for remote vehicle monitoring and control.
- User Interface and Experience
  - Human-Machine Interface (HMI): Designing intuitive interfaces for driver interaction with connected car features.
  - Voice Recognition: Integrating voice-activated controls for hands-free operation.
  - Integration with Infotainment Systems: Connecting vehicle systems with multimedia and entertainment features.
- Regulatory Compliance
  - Automotive Standards: Ensuring compliance with automotive regulations and standards related to connectivity and data privacy. Knowledge of regulatory requirements and standards relevant to automotive electronics and connectivity.
  - Industry Certifications: Obtaining certifications for quality management systems and cybersecurity protocols.
- Environmental Sustainability
  - Green Manufacturing Practices: Implementing sustainable manufacturing processes and reducing environmental impact.

- Lifecycle Assessment: Analysing environmental impacts throughout the product lifecycle and implementing recycling and disposal strategies.

- Project Management
  - Project Planning: Skills in planning and coordinating tasks, resources, and timelines for component development projects.
  - Risk Management: Ability to assess and mitigate risks associated with project execution and product delivery.
  - Cross-functional Collaboration: Experience in collaborating with teams across engineering, production, sales, and customer support functions.

4. Platform economy

4.1. Products

- In-Vehicle Services: GPS Navigation Systems, In-Car Wi-Fi, Infotainment Systems, Child Safety Seats, Roadside Assistance
- Convenience Products: Keyless Entry Systems, Mobile App Access, Contactless Payment Options, Real-Time Vehicle Tracking, On-Demand Vehicle Delivery
- Maintenance and Care Packages: Cleaning Services, Vehicle Sanitization Services, Tire Replacement and Rotation, Battery Maintenance for EVs
- Eco-Friendly Options: Green Driving Incentives, Eco-Driving Training
- Mobility Services: Ride-Hailing Integration, Carpooling Options, Multi-Modal Transportation Integration, First-Mile/Last-Mile Solutions, Public Transport Integration
- Safety and Security Products: Advanced Driver Assistance Systems (ADAS), Vehicle Tracking and Recovery Systems, Emergency Assistance Buttons, Driver Safety Training Programs, In-Car Surveillance Cameras
- Technology and Connectivity Solutions: Mobile Booking Apps, In-App Payment Systems, Telematics Solutions, Vehicle Health Monitoring Systems, User-Friendly Booking Portals

4.2. Services

- Vehicle Sharing Services: Peer-to-Peer Car Sharing, Business Fleet Sharing, On-Demand Vehicle Rentals, Long-Term Vehicle Leasing, Subscription-Based Vehicle Access
- Ride-Hailing and Ride-Sharing: On-Demand Ride-Hailing, Carpooling and Ride-Sharing, Luxury Ride Services, Airport Transfers, Event Transportation
- Delivery and Logistics: Last-Mile Delivery Services, Parcel and Package Delivery, Grocery Delivery, Courier Services, Freight and Cargo Transportation
- Vehicle Maintenance and Care: On-Demand Maintenance and Repairs, Mobile Mechanic Services, Vehicle Cleaning and Detailing, Tire Change and Rotation, Battery Replacement and Charging for EVs
- Charging and Fuelling Solutions: EV Charging Network Access, Mobile Fuel Delivery, Subscription Plans for Charging, Energy Management Services, Fuel Card Services
- Telematics and Data Services: Vehicle Tracking and Monitoring, Fleet Management Solutions, Driver Behaviour Analysis, Predictive Maintenance Alerts, Telematics Data Analytics
- Mobility as a Service (MaaS): Integrated Multi-Modal Transportation, Trip Planning and Navigation, Mobility Subscription Packages, Public Transport Integration, Bike and Scooter Rentals
- User Experience and Personalization: Personalized Vehicle Preferences, Customizable Rental Packages, User Profiles and History Tracking, Rewards and Loyalty Programs, User Feedback and Ratings
- Security and Compliance: Background Checks for Drivers, Vehicle Safety Inspections, Regulatory Compliance Services, Fraud Detection and Prevention, Data Privacy and Security Solutions
- Software and App Development: Custom Mobile App Development, Platform Integration Services, User Interface and Experience Design, API Management, Backend Infrastructure Support

- Data and Analytics: Usage Data Collection, Market Analysis and Insights, Customer Behaviour Analysis, Performance Metrics and Reporting, Predictive Analytics for Demand Forecasting

4.3. Critical production technologies

- Fleet Management Systems
  - Vehicle Tracking and Telematics: Utilizing GPS and telematics systems to track vehicle location, performance metrics, and maintenance schedules.
  - Remote Diagnostics: Implementing systems for remote monitoring and diagnostics to ensure vehicle health and efficiency.
  - Predictive Maintenance: Using data analytics to predict and schedule maintenance to minimize downtime.
- Vehicle Connectivity and IoT
  - Connected Vehicle Technologies: Integrating IoT devices and connectivity solutions for real-time communication between vehicles, users, and the central platform.
  - Vehicle-to-Infrastructure (V2I) Communication: Enabling vehicles to interact with smart infrastructure for traffic management, parking guidance, and energy optimization.
  - Data Analytics and Insights: Analyzing vehicle usage data to optimize fleet operations, improve efficiency, and enhance customer experience.
- Mobile Apps and User Interfaces
  - Customer Mobile Applications: Developing intuitive mobile apps for users to book, unlock, and manage vehicle rentals or rides.
  - Driver Applications: Providing apps for drivers to manage their schedules, navigate routes, and communicate with passengers.
  - User Experience Design: Designing user-friendly interfaces for seamless interaction with the platform and vehicles.
- Vehicle Sharing Technologies
  - Keyless Entry Systems: Implementing digital key solutions for secure access to vehicles without physical keys.
  - Vehicle Reservation Systems: Developing systems for users to reserve vehicles in advance through mobile apps or web platforms.
  - Payment Integration: Integrating secure payment gateways for seamless transaction processing for rentals or rides.
- Autonomous and Electric Vehicles (EVs) Integration
  - Autonomous Vehicle Deployment: Developing capabilities to integrate autonomous vehicles into the platform for on-demand transportation.
  - Electric Vehicle Charging Infrastructure: Establishing charging stations and infrastructure to support electric vehicles in the fleet.
  - Battery Management Systems: Implementing systems to monitor and manage battery health and charging schedules for electric vehicles.
- Supply Chain Management
  - Vehicle Procurement and Fleet Acquisition: Managing the procurement of vehicles suitable for shared mobility services, including negotiation with manufacturers or dealers.
  - Inventory Management: Optimizing vehicle inventory to meet fluctuating demand and ensure fleet availability.
  - Logistics and Distribution: Efficiently managing vehicle distribution and relocation within the service area to meet user demand.
- Safety and Compliance
  - Vehicle Safety Standards: Ensuring vehicles meet regulatory safety standards (e.g., crash tests, emissions standards) for passenger safety.
  - Insurance and Liability Management: Addressing insurance requirements and liability issues associated with vehicle sharing and autonomous operations.

    - Compliance with Local Regulations: Adhering to local laws and regulations governing vehicle sharing, autonomous driving, and data privacy.
- Data Security and Privacy
    - Data Encryption and Protection: Implementing robust cybersecurity measures to protect user data, transaction records, and vehicle operation data.
    - Privacy Policies and Compliance: Ensuring compliance with data privacy regulations (e.g., GDPR, CCPA) and transparent data handling practices.
- Customer Support and Service
    - 24/7 Support Services: Providing round-the-clock customer support for users and drivers, including troubleshooting, emergency assistance, and feedback management.
    - Maintenance and Cleaning Services: Establishing protocols for vehicle maintenance, cleaning, and sanitization to ensure a pleasant and safe user experience.
- Environmental Sustainability
    - Green Fleet Initiatives: Implementing strategies to reduce carbon emissions and promote sustainable mobility solutions.
    - Energy Efficiency: Optimizing vehicle operations and route planning to minimize energy consumption and environmental impact.
- Business Analytics and Performance Monitoring
    - Performance Metrics: Tracking and analyzing key performance indicators (KPIs) such as vehicle utilization rates, customer satisfaction scores, and revenue streams.
    - Market Insights: Utilizing data analytics to identify market trends, user behavior patterns, and opportunities for service expansion or optimization.

4.4. Critical competencies

- Technical and Operational Competencies
    - Fleet Management: Ability to oversee and manage vehicle fleets, including maintenance scheduling, logistics, and fleet optimization.
    - Vehicle Technology: Understanding of vehicle technologies, including electric vehicles (EVs), autonomous driving features, and connectivity solutions.
    - Data Analysis: Proficiency in analyzing operational data to optimize vehicle deployment, pricing strategies, and user experience.
    - Mobile and Web Platform Management: Skills in managing mobile apps, web platforms, and backend systems for seamless customer interactions and service delivery.
    - IoT and Connectivity: Knowledge of IoT devices and connectivity solutions to support vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications.
- Customer Service and Communication
    - Customer Relationship Management: Ability to build and maintain positive relationships with customers, addressing inquiries, complaints, and feedback promptly.
    - Effective Communication: Clear and concise communication skills, both verbal and written, for interacting with customers, drivers, and internal teams.
    - Conflict Resolution: Capability to resolve conflicts and handle challenging situations with diplomacy and professionalism.
    - Cultural Sensitivity: Awareness of cultural differences and considerations when interacting with a diverse customer base.
- Business Acumen and Strategic Thinking
    - Market Understanding: Awareness of market trends, competitor analysis, and industry dynamics in the mobility and transportation sectors.
    - Business Development: Skills in identifying growth opportunities, negotiating partnerships, and expanding service offerings.
    - Financial Management: Understanding of budgeting, cost control, and financial metrics to ensure profitability and sustainable growth.
    - Risk Management: Ability to assess risks and implement mitigation strategies related to operations, safety, and regulatory compliance.

- Regulatory Compliance and Safety
  - Regulatory Knowledge: Understanding of local, national, and international regulations governing transportation, data privacy, and vehicle operations.
  - Safety Protocols: Adherence to safety standards and protocols to ensure the well-being of customers, drivers, and the community.
  - Insurance Management: Knowledge of insurance requirements and protocols related to vehicle operations and liability management.
- Problem-Solving and Adaptability
  - Critical Thinking: Ability to analyze complex situations, identify root causes, and develop effective solutions.
  - Adaptability: Readiness to adapt to changes in technology, market conditions, and customer preferences.
  - Decision-Making: Capacity to make informed decisions quickly, considering multiple factors and stakeholders' interests.
- Teamwork and Collaboration
  - Cross-functional Collaboration: Working effectively with colleagues from diverse backgrounds, including operations, technology, marketing, and finance.
  - Leadership and Motivation: Inspiring and leading teams to achieve goals, fostering a collaborative and supportive work environment.
  - Project Management: Skills in planning, organizing, and executing projects, ensuring alignment with organizational objectives and timelines.
- Technology Adoption and Innovation
  - Continuous Learning: Commitment to staying updated with advancements in vehicle technology, mobility solutions, and digital platforms.
  - Innovation: Ability to innovate and implement new ideas to enhance service offerings, improve efficiency, and drive business growth.
  - User Experience (UX) Design: Understanding of UX principles to enhance customer interactions with mobile apps and digital platforms.
- Environmental and Social Responsibility
  - Sustainability Practices: Incorporating sustainable practices in operations, such as promoting electric vehicles, reducing carbon footprint, and supporting eco-friendly initiatives.
  - Community Engagement: Engaging with local communities, stakeholders, and policymakers to promote responsible and inclusive mobility solutions.

Appendix 4: EU survey (Annex 2 Competitive advantage factors for automotive regions)

Critical factors for a region to be in the game of electric, autonomous, connected vehicles

- Government Policies and Incentives
  - Financial Incentives: Offering subsidies, grants, tax breaks, or low-interest loans to attract investments in EV component manufacturing.
  - Regulatory Support: Implementing policies that promote EV adoption, such as emission standards, vehicle electrification targets, and infrastructure development.
- Infrastructure and Supply Chain
  - Industrial Zones: Developing dedicated industrial parks or zones with infrastructure tailored for EV component manufacturing.
  - Logistics and Transportation: Ensuring efficient transportation networks and logistics infrastructure for raw materials and finished goods.
  - Energy Infrastructure: Reliable and affordable energy supply, particularly renewable energy sources for sustainable manufacturing processes.
- Access to Raw Materials
  - Proximity to Raw Material Sources: Availability of essential raw materials such as lithium, cobalt, nickel, and rare earth metals used in battery manufacturing.
  - Supply Chain Integration: Strong logistics infrastructure and supply chain networks to facilitate timely and cost-effective procurement of raw materials.
- Skilled Workforce and Education
  - Technical Expertise: Availability of skilled labour with expertise in battery technology, electric powertrains, electronics, and automotive manufacturing. Availability of a skilled workforce with expertise in electronics, telecommunications, software engineering, and automotive technology.
  - Education and Training Programs: Proximity to educational institutions offering specialized programs in EV technology and manufacturing processes. Presence of universities and technical schools offering specialized programs in IoT, connected vehicle technology, cybersecurity, and data analytics.
  - Technical Education: Collaborating with educational institutions to develop programs focused on EV technology, battery manufacturing, and related skills.
  - Workforce Training: Providing training programs to upskill or reskill the workforce in advanced manufacturing techniques and EV-specific technologies.
- Research and Innovation Ecosystem, technology hubs
  - Research Institutions: Presence of research institutions, universities, and technology parks conducting research in battery chemistry, materials science, and advanced manufacturing, IoT, vehicle-to-everything (V2X) communication, cybersecurity, and artificial intelligence (AI) for autonomous systems. Partnering with research institutions and universities conducting research in EV technology, battery materials, and advanced manufacturing processes.
  - Technology Transfer: Facilitating technology transfer from research institutions to industry for commercialization of innovative EV components.
  - Tech Ecosystem: Presence of a vibrant technology ecosystem with expertise in IoT, telecommunications, software development, and vehicle connectivity solutions.
- Proximity to OEMs and to markets
  - Access to OEMs: Being located near major EV manufacturers facilitates efficient supply chain management, reduces logistics costs, and fosters collaboration opportunities.
  - Market Size and Growth: Demonstrating a growing market for EVs with supportive consumer demand, infrastructure development, and government incentives.
  - Strategic Location: Proximity to major EV markets or OEMs, facilitating access to customers and supply chain integration. Located in or near regions with high adoption rates of connected vehicle technologies and supportive regulatory environments.
- Supplier Ecosystem and Collaboration

  - Local Supplier Network: Building a robust network of local suppliers capable of supplying components and materials needed for EV manufacturing.
  - Cluster Development: Encouraging clustering of EV component suppliers and OEMs to foster collaboration, innovation, and economies of scale.
- Business Environment
  - Ease of Doing Business: Streamlined regulatory processes, transparent legal framework, and business-friendly policies for foreign and domestic investments.
  - Support Services: Access to business support services such as financial consulting, legal advice, and market intelligence tailored for EV component suppliers.
- Environmental Sustainability
  - Green Manufacturing Practices: Emphasizing sustainable manufacturing practices, including waste reduction, energy efficiency, and carbon footprint reduction.
  - Certifications and Standards: Meeting international environmental standards and certifications for manufacturing processes and products.
- Political Stability and Risk Mitigation
  - Political Stability: Providing a stable political environment that ensures continuity in policies and governance.
  - Risk Management: Mitigating investment risks related to geopolitical tensions, economic fluctuations, and regulatory changes.