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# VISUAL REPRESENTATIONS OF A REGIONAL ECONOMIC SUBSYSTEM. AN ANALYSIS

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## Abstract

This research includes an analysis of the visual representations elaborated for the features of the agricultural sector in the south-eastern region of Romania. The source of this visual imagery is a student's project and PowerPoint presentation. The first author of this paper is also the one authoring the project and the respective imagery. Our study focused on several investigation directions concerning the student's project: presentation structure and internal logics; information relevance; underlining the connections among subsystem components and between the respective subsystem and the ones at higher levels; identifying the strengths and weaknesses of the analysed economic sector, the extant and possible opportunities and threats; use of visual imagery (student's own elaboration) such as thematic maps and charts about the subsystem components and relationships among those. We collected part of the research data about the content of the student's project through the interview method and participatory observation. The analysis of this project was realised using three assessment grids comprising various criteria and indicators. The designed analytical tools were useful and increased the objectivity level of the assessment. We concluded that the results of our analysis and especially the assessment grid could be used in the future as feedforward in similar activities.

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*Keywords:* Assessment grid, cartographic competences, GIS, geographical study, university education



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## 1. Introduction

During the Bachelor's and Master's studies, students from the Faculty of Geography develop transversal competences and competences which are specific to their specialisation (Andronache & Dulamă, 2020) and are included in the category of reproductive and productive competences (Brien, 1997). Research in the didactics of geography in Romania was focused on building and testing analytical assessment grids for reproductive competences, developed for geography students: to elaborate topographic profiles (Osaci-Costache et al., 2013b), to elaborate column charts (Osaci-Costache et al., 2013a). Other studies focused on using analytical assessment grids for productive competences in geography: to elaborate touristic plans (Osaci-Costache et al., 2013), to elaborate proposals of spatial planning measures for river basins (Dulamă, Ilovan & Nițoaia, 2016), to analyse the cultural landscape (Dulamă, Vana & Ilovan, 2016), to elaborate graphic organizers (Koszinski et al., 2019), to analyse landscapes during geography university studies (Ilovan et al., 2019), and to represent urban space (Dulamă et al., 2020).

The systemic nature of regions has been much explored, documented and represented through text and images in the last decades in the regional geographical literature of Romania (Ilovan, 2009) and Europe (Paasi, 2009), while discussing factors supporting and conditioning local and regional development.

Visual methods of producing and representing the regional space are part of the mixed (i.e. quantitative and qualitative) tools that Regional Geography uses when researching regional systems (Ilovan & Doroftei, 2017; Magdaș et al., 2018). Geography, as a visual discipline, has become increasingly careful about reflecting critically how it produces and interprets visual imagery (Bartram, 2010; Doroftei, 2017; Ilovan, 2019; Rose, 2014). In geography, images are used to represent space, relationships among spatial and societal components and thus enabling the transmission of knowledge in a world where the visual is occupying a central place.

## 2. Problem Statement

During the Master's studies, the students from the Faculty of Geography develop a higher level of specific competences which are related to their specialization, by carrying out geographical studies and projects for a long period or for a semester. In these integrating activities, in order to build a system of competences, students face some difficulties. Students need a large amount of knowledge in regional geography, geographical systems and regional development and they need to understand, in a profound manner, the principles to elaborate a regional geography study. The lack of knowledge and understanding on how to approach specific questions of regional geography may be significant obstacles in managing this complex task successfully, and in broader terms, in students' becoming sensitive to community and global issues (Albulescu & Albulescu, 2015).

## 3. Research Questions

Master students received the individual task to elaborate a case study on a subject which they could develop for a development region in Romania. They could choose from one of the three suggested topics by the professor (for example, energy sector, agricultural sector, labour force, and unemployment),

providing that there were no thematic overlaps. For each subject, they were given an indicative structure. During the courses and seminars, the teacher provided students with directions, information, clarifications, answers to questions, workflows, and examples. Regarding the accomplishment of this task, the questions we will answer in this research are: What is the structure of this geographical study as designed and developed by the student? Which are the relevant geographical aspects that are presented and represented? How are highlighted the connections among the components of the agricultural sector and between this system and the higher-level systems? How are the visual images – thematic maps and charts – used to represent the components of the subsystem and the links between them? What are the strengths and weaknesses of the assessed economic sector, what opportunities and threats are noticed by the student?

#### **4. Purpose of the Study**

The aim of this research is to analyse the visual representations which were elaborated by a M.Sc. student, in order to highlight, through a case study, the specific characteristics of the agricultural sector in the South-East Region of Romania, in a PowerPoint presentation. Some aspects regarding the conduct of this geographical study and its analysis as a product was performed by the researchers, as external evaluators, after the student's graduation. The visual representations are analysed taking into consideration the direct relationship with the text content and as integrated elements in the PowerPoint presentation, considered as a unitary product. To increase the quality of the analysis, this is realised using several assessment grids created by the researchers, so that those tools may be later used in the assessment of other geographical studies conducted by students.

#### **5. Research Methods**

*Data collection.* We collected the data about the way the student conducted the study through an interview, when the first author answered the other researchers' questions. We analysed the text from the geographical study through thematic content analysis, while the visual materials were analysed visually. To assess the geographical study, we built three assessment instruments: the assessment grid of the text content and its representation in visual materials (Table 1); the assessment grid of the visual materials (Table 2); the assessment grid of the SWOT Analysis of the regional agricultural sector (Table 3).

*Participants.* In this research, the first author participated as a volunteer. The first author is a M.Sc. student, first year, in the Regional Planning and Development master programme of the Faculty of Geography, within Babeş-Bolyai University. The student agreed on her project being analysed and evaluated with the assessment grids and on answering interview questions. The other researchers were involved in the external analysis and assessment of the geographical study, in designing and using the assessment grids and in the analysis of results.

*The research material* includes the PowerPoint presentation (title: "The regional economic subsystem. Case study: the agricultural sector in the South-East Region") created by the first author, first author's answers to the interview and the results obtained after the use of the assessment grids which we designed. Research data were processed by using specific tools of Educational Sciences (Magdaş, 2018).

## 6. Findings

### 6.1. Analysis of the presentation structure for the case study

Although a typical geographical case study is supposed to identify a problem, causes, conditions and solutions (Dulamă, 2010), we created this analysis taking into account the structure, which was proposed by the course professor, presented by the student, and a virtual structure, which was generated by the researchers. This virtual structure represents the “key” to a critical lecture. We took into consideration that the professor’s proposed structure (*I. Territorial context, II. Agricultural resources – typology, distribution, exploitation, III. Use of agricultural resources, IV. SWOT Analysis of the regional agricultural sector*) was partially changed by the student, who grouped the information into three categories: *I. Territorial context, II. Main branches of agriculture, III. SWOT Analysis*.

Based on the professor’s proposed structure and the student’s detailed aspects, in Table 1, we presented, using criteria, the content elements and we associated a list of useful indicators to assess the study. This grid enables a systemic analysis of the content of the case study, of the sets of presented information, of the order of their presentation and of the identification of the gaps. Based on the grid, we conducted a quantitative assessment. We assigned one point to each checked indicator and a lower value for partially checked indicators. The results show (Table 1) that maximum points were obtained for 23 indicators (67.64%), lower scores for six indicators and 0 points for five indicators, out of the total of 34 indicators. All in all, a mean of 0.74 was obtained. This assessment is indicative because the criteria list and indicators can be modified depending on the pursued aims. Given that the study was conducted in a semester and it did not represent a doctoral thesis, we appreciate that most of the important aspects on the subject have been addressed.

**Table 1.** Assessment grid of the text content and its representation in visual materials

Content elements	Criteria	Indicators	Visual representation	Score	
<b>Territorial context</b>	Geographical position and extent	Area		1	
		Percentage of the studied territory at national level		1	
		Included administrative units	Specificity of the counties from the South-East Region (map)	1	
	Relief	Specificity of landforms	Predominant landform		1
			Average, minimum, and maximum altitude	Hypsometric map and communication network in the South-East Region	0.5
		Brief presentation of relief subunits	Relief subunits in the South-East Region (map)	1	
	Climate	Temperature		0.5	
		Precipitation		0.5	
	Land fund	Soil types	Soils in the South-East Region (map)	1	
	Land improvements	Spatial distribution of the soils	Used chemicals (insecticides, fungicides, herbicides, fertilizers)	Quantity of used fungicides; Quantity of used insecticides; Quantity of used herbicides (column chart, by county)	1

		Dry land area	Dry land area, by county (column chart, by county)	1
		Irrigated land area	Irrigated land area, by county (column chart, by county)	1
	Land use	Types of use	Land use in the South-East Region (map)	1
		Spatial distribution of each type of use	Percentage of types of use (chart)	1
<b>General characteristics of the agricultural sector</b>	Area	Percentage of agricultural land at regional level		1
	Production	Percentage of agricultural production at national level		1
	Labour force	Percentage of employed population in the agricultural sector at regional level		1
	Public / private sector	Percentage of private sector		1
<b>Agricultural resources</b>	Typology	Categories of vegetal agricultural resources and specific predominant plant species		1
		Categories of zootechnical agricultural resources and specific predominant species		1
	Distribution	Spatial distribution of each category of vegetal agricultural resources on administrative units (counties)	Cultivated area with wheat; Cultivated area with corn; Cultivated area with sunflower; Cultivated area with vegetables; Vineyards area; Orchards area; Forest area (column chart, by county) Number of trees, by county (table by county)	1
		Spatial distribution of each category of zootechnical agricultural resources on administrative units (counties)	Cattle, horses, swine, birds (column chart, by county)	1
Exploitation	Production on categories of vegetal agricultural resources and specific predominant plant species	Wheat production; Corn production; Sunflower production; Vegetables production; Grape production (column chart, by county)	1	
	Production on categories of zootechnical agricultural resources and specific predominant plant species		1	
<b>Use of agriculture resources</b>	Own consumption	In individual households		0
	Trade	Local, county, regional level		0
		National level		0
		International level (export)		0
Industrial processing	Food industry (sugar; sugar products; starch, glucose and dextrin; vegetable oils; meat and meat products; milk and dairy products; milling, bakery and flour products; use of fruit and vegetables, alcohol and		0.3	

	alcoholic beverages, beer, wine, tobacco)	
	Other industries	0
Tourism	Agritourism	0.2
	Ecotourism	0.2
<b>Mean</b>		<b>0.74</b>

## 6.2. Presented and represented relevant geographical aspects

From the analysis of the presented information from the text, the most (about 95%) was relevant to the topic (Table 1). Also, we identified interesting information, but it was not relevant (muddy volcanoes in Policiori – Berca – Arbănași area in Buzău County; the only surface oil depot in Europe, located in Berca – Monteoru area, Buzău County). In this context, we consider that an extended presentation of the climatic conditions was required, given their essential role in agriculture. Use of agricultural products was less taken into consideration, except for the information regarding wine industry and tourism.

## 6.3. Highlighting the connections between the components of the system

One of the strengths of this study refers to the interactions between the elements of the agricultural sector and higher-level systems (for example, the impact of relief, soils, and climate on agriculture). Aspects regarding connections on the same level were also addressed, for example: percentage of the employed population in agriculture, population aging, the lack of labour, and qualification level. In the oral presentation of the study, many more relations among the components of the agricultural system and between the system and higher levels were mentioned.

## 6.4. Representation of the components of the system and of the relationships among these, in visual materials

The analysis of the visual materials was the main objective of this research. We took into consideration not necessarily a cartographic perspective, but a perspective which allowed the geographical information representation in a manner easy to perceive and to understand by those who read the geographical study. In literature, there are specific grids for rigorous map analysis (Dulamă, 2010), column charts (Osaci-Costache, Dulamă & Ilovan, 2013), but in this case, an assessment of the set of maps and charts is required. To achieve this aim, we built an assessment grid of the visual materials (Table 2), for three categories of materials: maps, charts, and PowerPoint presentation. The grid included only the visual materials which were used in this study.

In the analysis of the maps and charts, we took into consideration two aspects, which were considered criteria: the content and the execution. Regarding the content of the map and charts, three aspects were considered more important: the representation of all-important aspects for the subject, the representation of elements included in the studied area, correspondence among title, legend and content. For the maps, we also analysed the manner in which the elements included in the studied area were highlighted, and for the charts, we analysed the manner in which the hierarchies and the evolution of geographical processes were underlined. Regarding the creation of maps and charts, we analysed whether they included the necessary elements, if the cartographic requirements were met, if the data source and the

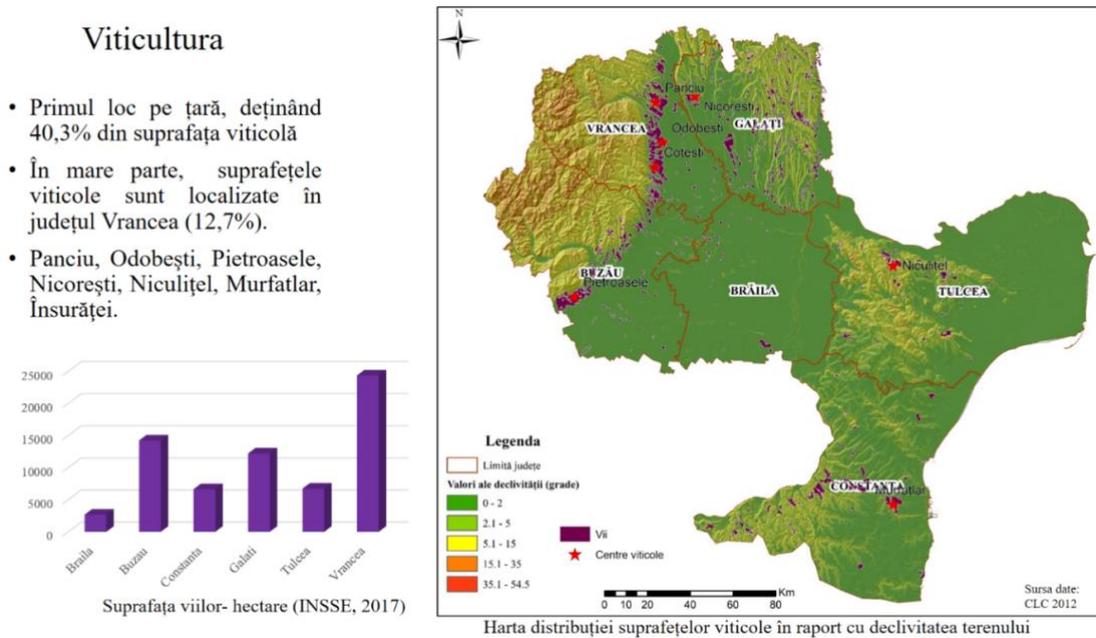
author were mentioned. For the maps, we also assessed the dynamic of the data map and the percentage of the maps which were created from scratch, as well as the percentage of the processed maps.

For the PowerPoint presentation, we analysed three aspects: the text document, visual imagery, and slide organisation. For the analysis of the text in each slide, we analysed if it provided the necessary information on the topic (completeness), if it was brief / synthetic, if it had structure and if there was an optimal ratio between the essential information and the detailed, specific one. Regarding the visual imagery, we analysed the ratio between the position on slides with other materials and text, the size of the visual materials to ensure the visibility of details and legibility, the percentage of the occupied area with visual materials on each slide. We analysed more aspects regarding the concept and organisation for every slide: how the visual material combined with oral information, what was the degree of loading with the visual materials and text, how information on each slide was introduced (dynamic, interaction with the person who viewed the slide), and general appearance (Figure 1).

**Table 2.** Assessment grid of the visual material

<b>Material category</b>	<b>Criteria</b>	<b>Indicator</b>	<b>1-10</b>
Maps	Content	It illustrates all important aspects of the topic.	8
		It represents elements of the study area.	9
		It highlights connections among the elements of the study area.	10
		Correspondence among title, legend, and map content.	10
	Execution	It includes the necessary elements.	9
		It observes cartographic requirements.	9
		It mentions data sources.	10
		Dynamic of the data presentation on maps.	10
		Percentage of the maps created from scratch related to processed maps.	9
Charts	Content	It illustrates all important aspects of the subject.	8
		It represents elements of the study area.	8
		It highlights hierarchies, evolutions.	8
		Accordance among title, legend, and content.	10
	Execution	It includes the necessary elements.	9
		It observes cartographic requirements.	9
		It mentions data sources.	10
PowerPoint presentation	Text information	Completeness	9
		Brief / synthetic	10
		Structure	9
		The essential information / particular information ratio.	9
	Visual information	Slide placement in relation to other materials and text.	10
		Size of visual materials.	10
		Percentage of the occupied surface with visual materials on the slide.	10
	Slide organisation / concept	Combining verbal and visual information.	10
		Degree of loading with visual and text materials.	10
		Information dynamics	10
		General appearance	10
<b>Mean</b>			<b>9.03</b>

The points indicate a creative and harmonious PowerPoint presentation, which keeps the focus of the viewer throughout its progress. The points from 1 to 10 (Table 2), which were given to every indicator, out of 27, indicate that the execution of the maps and charts is of good quality and represents the topic, with also a good proper structure with the text and PowerPoint presentation. The mean of 9.03 from the grid indicates a very good visual representation of the geographical aspects in the agricultural sector in the South-East Region. The initial perception of the visual materials was confirmed, as a consequence of the assessment with the designed tool, which recommends it to be used, with the necessary adaptations, for the assessment of other systems of the visual imagery, which are included in regional geography case studies.



**Figure 1.** Slide within the PowerPoint presentation (in Romanian), realised by the M.Sc. student

### 6.5. The analysis of strengths, of weaknesses of the studied economic sector, of the opportunities and threats, existent and potential, within the SWOT Analysis

The mentioned aspects in the student's geographical study were included into the assessment grid (Table 3). We offered one point if the mentioned aspect was appreciated as being correct in the agricultural sector of the South-East Region. The number of weaknesses was bigger (11) than the number of strengths (3), which indicated many problems in the system. Regarding the identified opportunities, the number was bigger (7) than the number of threats (3). Definitely, a longer term and more profound analysis can complete the SWOT Analysis. The fact that all the identified aspects were correctly included in the category, indicated student's good understanding of the significance of the four categories, and the large number of aspects, as well as their explanations in text indicated student's profound understanding of the sector and of the region due to her rigorous documentation.

**Table 3.** Assessment grid of the SWOT Analysis of the regional agricultural sector

Category	Identified aspect	Score by aspect (1p)	Score by category
<b>Strengths</b>	Existence of natural resources which allow agricultural development (soils, low altitudes, low slopes)	1	<b>4</b>
	Execution of land improvement works	1	
	Expansion of nursery areas	1	
	Existence of fishery resources	1	
<b>Weaknesses</b>	Intense fragmentation of the relief	1	<b>11</b>
	Insufficient irrigation systems	1	
	Fruit tree plantations are aged or abandoned → productivity is low	1	
	There is no diversity in tree species	1	
	Practiced agriculture on small areas	1	
	Use of traditional obsolete techniques	1	
	Large number of subsistence farms	1	
	High percentage of rural population, employed in subsistence agriculture	1	
	Low capacity of processing agricultural products	1	
	No market	1	
	Insufficient endowment of sea fishing vessels	1	
	<b>Opportunities</b>	Investments for the rejuvenation of old plantations	
National and European programmes to support agriculture development		1	
Increased demand for agritourism, wine tourism		1	
Development of agro-industrial parks and processing units for agricultural products		1	
State support for young farmers		1	
Stimulation of productivity due to the implementation of law no. 150/2016, regarding the marketing/commerce of local products in proportion of 51%		1	
<b>Threats</b>	Migration of the young population and highly skilled workforce	1	<b>3</b>
	Increasing competition from imported wines	1	
	Land use changes (agricultural → built space)	1	
<b>Total</b>		24	<b>24</b>

## 7. Conclusion

The conclusions of this research are focused on many directions in connection to the aim and the questions for which we looked for answers. A first conclusion refers to the evaluators' competences, so that we highlight that in order to assess a case study in regional geography, the evaluators should have specific competences in this branch of geography, as well as assessment competences – which are specific to educational sciences – and allow them to design and test assessment tools. Having competences in both mentioned fields ensures the premises for a correct assessment study and conclusion, in order to capitalize the research results in other contexts.

Analysing the structure of the geographical study which was created by the M.Sc. student, we concluded that the student changed the title of some subtitles (suggested by the professor), but, within these, the student approached most of the necessary and essential aspects for such a case study, proving competences in structuring the contents in a thematic order. In the text information and in visual representations, which were included in the presentation, there are highlighted geographical aspects, which

are relevant to the agriculture sector in the South-East Region, with the exception of some interesting information, but with less significance to the study. Both in text and in visual materials, there are presented and represented the components of the agriculture system and the connections among them, as well as between the higher-level systems and those which are similar, hierarchically. Highlighting the connections among the components of the systems was carried out in a creative manner, using signs (arrows), and introducing gradually elements in map content, in a spectacular manner, capitalizing the opportunities of the PowerPoint presentation.

The presentation of the agriculture system in the South-East Region was done rigorously, systematically, synthetically, comprehensively, and observing principles and requirements, which should be met by a study in geography. Together with the text, the visual imagery – maps and charts – are well integrated on each slide, providing the viewer with a complex image on each subtheme, but easy to perceive and follow. In the SWOT Analysis, more weaknesses were highlighted than strengths, more opportunities than threats (existent and potential), which indicated student's good knowledge of the analysis method, of the agriculture system and of the South-East Region.

The analytical tools (the assessment grid of the text and its representation in visual materials; the assessment grid of the visual material; the assessment grid of the SWOT Analysis of the regional agriculture sector), which were designed to assess this case study, were useful and increased the objectivity level of the assessment, highlighted certain gaps and aspects which could be improved in future studies.

All in all, the case study met the requirements of a paper of geographical analysis for a region in Romania, from the perspective of the agricultural sector. The presented assessment tools can be used by professors and teachers to give feedback to students and to draw attention to the aspects which require additional information, having the purpose to develop competences and to aim toward continuous learning.

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Authors contributed equally to this paper.

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