APSTRACT

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Contents

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Contents

Applied Studies in Agribusiness and Commerce – APSTRACT
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PERCEPTIONS, PROFITABILITY AND DETERMINANTS OF GRANULATED CASSAVA PACKAGING IN KUMASI METROPOLIS, GHANA

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Abstract: *Packaging does not only protect a product but also provides directions for using the product, as well as relevant information about its content and nutritional value. This study was undertaken to assess Granulated Cassava (Gari) sellers' perception, profitability and determinants of packaging in Ashanti Region. The study area was purposively selected because of the active participation and contribution of marketing activities. A structured questionnaire was administered in the form of interview to obtain primary data from the respondents. Data was generated using binary and multinomial logit regression model and Garret ranking technique. The results showed that there is 0.11% difference in the gross margin of both ventures which is also statistically significant at 1%. Years of education, legal requirement, and durability of the packaging material and cost of packaging material were the significant factors that influence sellers' choice of packaging. Lack of technical know-how, cost of capital equipment and lack of knowledge on packaging equipment and/or material were the most limiting constraints affecting Gari packaging. The study recommends that investors should invest in the Gari packaging business since it has a relatively higher rate of returns as compared to the unpackaged one.*

Keywords: *Gari, Gari Packaging, Gari Sellers, Granulated Cassava, Perception, Profitability*

INTRODUCTION

In this contemporary time, advertisers compete with each other to promote their position in the market, increase efficiency and attract customers' attention. Packaging is one of the most critical factors or components in the value addition chain of activities in the food or agro-processing industry. A good package sometimes gives a company more promotional effect than it could possibly afford with advertising creating a brand loyalty. It also gives directions for using the product, as well as relevant information about its contents, nutritional value and potential hazard(s). An adequate packaging helps to reduce malnutrition, removes local surpluses and helps to attract the consumer's attention (Anin, 2008).

As it is the first point of interaction with consumers, a lot of manufacturers, retailers and small business marketing geniuses are focusing on how they can improve their product packaging in order to lure more shoppers to buy their product. This has become the focus of many designers, to bring out the best packaging which seeks to protect products through their distribution channels and to communicate the product benefit to its target group. This can increase the chances of converting the sheer packaging interest to actual sales which in return will improve the performance of the business (Bix, 2003).

The production, storage and marketing of Gari is still mainly carried out by local farmers, processors and foodstuff traders, while only a few highly mechanised processing plan market their products in consumer packaged forms (Oyeniran, 1980). Gari is still being packaged, transported and stored in woven sacks with attendant fluctuations in climatic conditions and sometimes it is being sold in the market in bowls with exposed surfaces thus increasing its susceptibility to environmental contaminations (Ogiehor & Ikenebomeh, 2006).

According to the Food and Drugs Board Legislative Instrument (LI) 1541, packaging is a mandatory requirement necessary for the sale of products by every business. Packaging has thus far been demonstrated to be a difference maker; it could make or break a brand or a business entity. Effective and efficient packaging of food and beverage products have been advocated as a means of developing new food products that impact positively on marketability and product quality (Mante, 2005). Studies have indicated that product packaging encompasses; the physical aspect of the container, the design,

the shape, the color, the labeling and the material used (Ampuero & Vila, 2006). Considering the cumbersome nature of production process, the need to have the finished products to cities where large buyers live, the importance of Gari in dietary intake and the need to meet the increasing international demand, the evaluation and identification of adequate packaging materials that will keep the overall quality of Gari during distribution and at the point of consumption becomes imperative (Ogiehor & Ikenebomeh, 2006).

For many consumer non-durables and durables, packaging may have direct function in terms of product satisfaction, customer trial and repetitive purchase. With regards to product satisfaction and repeat repurchase, packaging is useful due to the fact that packages poorly designed may discourage repurchase (Bloch, 2005). Consumers who are frustrated by packages that cannot be easily opened or labels that cannot be read without magnification may opt for brands that have considered the "human condition" in their package design (Bix, 2003). As a result of this, companies focus on product packaging, considering the graphics, color and appropriate packaging materials to increase their market share or business performance. According to Ghani & Kamal (2010), packaging plays a key role in product display as much impulse buying occurs as a result of product display. Thus packaging is an effective tool and as market mix has a strong potential to engage consumers. This is because consumers draw information about the product and its attributes from the package's aesthetic and graphic design (Moskowitz et al., 2009). Manufacturers may use packaging design to initiate expectations in the consumer about a product. These expectations may come from packaging design cues such as colors, words, symbols, materials, shapes and images which may in one way or the other carry a semiotic influence (Durgee, 2003).

Product Packaging possesses the potential to determine the success within a given market. It's certainly not the only determinant of business success but it sure plays a pivotal role. Packaging is not merely a production concern but also a marketing concern (Dunoo, 2016). A good package sometimes gives a company more promotional effect than it could possibly afford with advertising creating a brand loyalty. There is a strong and broad demand for packaged products in sub –Sahara Africa and this has a growing potential market population projected to double from 1.2 billion in 2015 to 2.4 billion by 2050 (Food and Agriculture Organization, 2012). In addition to the large local market for Gari there is huge opportunity with a much higher profit potential in exporting this product to Africans living in the US and Europe. However, there are strict guidelines concerning foods exporting to these countries (Jwuoha, 2013).

Despite the policies formulated and implemented by the Government of Ghana through the Ministry of Food and Agriculture and Ministry of Trade and Industry with regards to Gari packaging, the producers of Gari still use inappropriate storage and packaging methods for the product like hessian bags and transparent plastic polyethylene sheets (Oyelade et al., 2001). A cursory observation of made in Ghana Gari reveals that many sellers give little or no attention to the packaging of their Gari (Dunoo, 2015). Poor or inadequate Gari packaging constitutes a major constraint to investors as well as manufacturers. Although some of the locally made Gari are considered to be of high quality and unique to the country, they are not accepted as good packaged products to reap the full benefits of the product, especially outside the local market (Institute of Packaging Ghana (IOPG) Situational Analysis Report, 2014). This is a worrying trend with disastrous consequences. On November 1st 2015, the Government of Ghana placed a ban on light plastic materials with less than 20 microns (one millionth of a metre in term of density) such as the ones used in packaging Gari, sugar and porridge. This formed part of the government's effort in addressing the sanitation challenges the country is grappling with (www.myjoyonline.com).

According to the World Health Organization (WHO), one in every ten people falls ill from consuming contaminated food every year as a result of inappropriate packaging although local statistics are unavailable because of low reporting of condition at hospitals (myjoyonline.com). Most Gari produced in Ghana lack the good qualities a packaged product should possess. The container is either not appropriate for the product, or the illustration is not able to display the required information concerning the product, or the layout is overcrowded. As a result, there have been an increasing incident of waste disposal problems because of the non-biodegradable nature of the packaging material used (Sailaja & Chanda, 2001). The poor packaging has also impeded the export of this commodity to the EU and other markets. As a key element in the marketing mix, the benefits derived from Gari packaging could be immense if serious attention is given to it. It is therefore imperative to undertake this study to assess sellers' perception, profitability and determinants of Gari packaging. The following were the research questions; What are the forms and extent of packaging on Gari? What are the cost and returns involved in the packaging of Gari? What is the seller's perception on Gari packaging? What are the determinants and choice of Gari packaging? What are the constraints of Gari packaging?

RESEARCH METHODOLOGY

Kumasi Metropolis was chosen as the study area because the area contains a fairly large number of Gari sellers. The research design adopted was survey design, which involves the collection of qualitative and quantitative data that was quantitatively analyzed using descriptive and inferential statistics. This research design was employed in the study with the aim of assessing sellers' perception, profitability and determinants of Gari packaging.

This study employed the multistage sampling technique to obtain the primary data. The 3 Sub-metros were selected purposively in the first stage because they are amongst the high and middle income suburbs noted in Gari production and consumption. Furthermore, the respondents were selected from each market using snowball sampling technique because the respondents for the study were difficult to locate and questionnaire was distributed to hundred and twenty-two (122) Gari sellers in Kumasi metropolis making the total sample size for the study 122 respondents. Data on the socio-economic characteristics of the Gari sellers was coded, summarized using descriptive statistics such as means, charts, frequency distribution table and percent-

ages generated using the SPSS, STATA and Microsoft Excel. Income statement approach was used to analyze the cost and returns of the Gari selling business. The perception index was used to analyze seller's perception on Gari packaging. The factors that influence sellers' decision to package as well as choice of packaging were estimated using the binary and multinomial logit regression model. The various constraints of Gari packaging were ranked using the Garret ranking technique.

Profitability Analysis

Profitability is ability of a company to use its resources to generate revenues in excess of its expenses. In other words, this is a company's capability of generating profits from its operations. It is the primary goal of all business ventures and without it the business will not survive in the long run. Profitability is measured with income and expenses. Income is money generated from the activities of the business whereas expenses are the cost of resources used up or consumed by the activities of the business. Profitability actually looks at the relationship between the revenues/ incomes and expenses to see how well a company is performing and the future potential growth a company might have.

Although profit and profitability are used interchangeably, they are not the same since there are some distinct differences between the two. Profit is an absolute number determined by the amount of income or revenue above and beyond the costs or expenses a company incurs. It is calculated as total revenue less total expenses and appears on a company's income statement or trading profit or loss accounts. No matter the size or scope of the business or the industry in which it operates, a company's objective is always to make a profit. Profitability on the other hand is closely related to profit, but it is used to determine the scope of a company's profit in relation to the input employed. This is to say that profitability is a measurement of efficiency and ultimately its success or failure. It is therefore a relative figure and not an absolute figure like the profit. Profitability can therefore be said to be the ability of a business to produce a return on an investment based on its resources in comparison with an alternative investment. This means that although a company can realize a profit, this does not necessarily mean that the company is profitable.

Profitability is one of the four building blocks for analyzing financial statements and company performance as a whole. The other three are efficiency, solvency, and market prospects. There are many different ways for analyzing the profitability of a venture. The four common ones are Gross margin analysis, Net margin analysis, Operating margin and Return on assets. The first way of analyzing profitability is considered in this study.

The estimation of the profit margin percentage for packaged and unpackaged Gari, was formulated as follows:

$$Gross\ Margin = \frac{\text{Gross Profit}}{\text{Sales}}\ x\ 100\%$$

Where;
Gross profit= Total revenue – Total variable cost
Sales= Unit sold * Unit price
Total Variable Cost = Total Quantity of Output * Variable Cost Per Unit of Output

(Source: https://www.thebalancemb.com)

Empirical specification of the binary logit regression model

The binary logistic model was employed in analyzing the factors that determine sellers' decision to package since the observation falls into two categories (decision to package or not to packaged) of dichotomous dependent variable. The empirical specification of the binary logistic model for ascertaining the factors that determines sellers' decision to package a product is outlined below.

$$Yi = \beta o+\beta 1SEi+\beta 2EDUi+ \beta 3QTYPi + \beta 4LRi + \beta 5PSi+ \beta 6SLi + \beta 7DUi + \beta 8PMi + \varepsilon i$$

Yi denotes seller's decision to package Gari as the dependent variable, β1 to β8 represents the various coefficients of the independent variables to be estimated while βo and εi represents the constant and the error term respectively. Table 3.1 presents the variables used in the regression model, their definitions, measurements and a-priori expectations.

Description of variables

Table 1: Description of variables

Variable	Definition/Meaning	Measurement
βo	Constant	
εi	Error Terms	
β1- β7	Coefficients	
Dependent variable		
Yi	Sellers decision to package	
Independent variables		
Variables	**Measurement**	**A-prior sign**
Experience (SEi)	Years of selling Gari	+/-
Education (EDUi)	Number of years in formal education	+
Quantity purchased (QTYPi)	Kg	+/-
Legal requirement (LRi)	1 = yes, 0 = otherwise	+/-
Product safety (PSi)	1 = yes, 0 = otherwise	+/-
Shelf life (SLi)	1 = yes, 0 = otherwise	+/-
Durability of packaging material (SLi)	1 = yes, 0 = otherwise	+
Packaging material cost	GH₵	+

Source: Field Survey, 2021

Description of independent variables and a-priori expectations

Several factors were considered as variables in determining the seller's decision to package or not to package Gari. These variables have their expectation and influence on sellers' decision to package or not to package. Basically, the study expects some variables to have a positive influence and others to have a negative influence on sellers' decision to package or not.

Years of selling experience: Years of selling experience of the respondent was expected to affect the sellers' decision to package negatively. This means that the higher the number of years of selling experience, the more likely respondent would not package. This is because, the more years of the sellers' experience to sell without packaging the more likely he/she will be convinced not to package with an idea of not adding any further additional cost.

Education: The education of the respondent was expected to influence their decision to package positively. This is where collection of data focused on the number of years in formal education implying the higher the number of years in formal education, the more likely the person would package his/her Gari. This is because people with higher number of years in formal education were expected to have more knowledge on the benefits of packaging Gari.

Quantity purchased: Quantity purchased is also another variable which was expected to influence the sellers' decision to package negatively. This is because people with higher quantity of purchase incur high variable cost which in returns discouraged them from adding further cost of packaging.

Legal requirement: Another variable was legal requirement. Legal requirement was expected to influence their decision positively or negatively. More specifically, the study recorded the legal requirement as a dummy variable where 1 represented yes (if the seller considers) and 0 represented no (otherwise).

Product safety: Another variable was product safety. Product safety was expected to influence their decision positively or negatively more specifically, the study recorded the product safety as a dummy variable where 1 represented yes (if the seller considers) and 0 represented no (otherwise).

Shelf life: Another variable was product shelf life. Shelf life was expected to influence their decision negatively or positively, the study recorded the product shelf life as a dummy variable where 1 represented yes (if the seller considers) and 0 represented no (otherwise).

Durability of the packaging material: The expected influence of this variable was positive. This is because the durability of the packaging material has positive influence on controlling product wastage during distribution since quality packaging material would directly control product leakage. The study recorded the durability of the packaging material as a dummy variable where 1 represented yes (if the seller considers) and 0 represented no (otherwise).

Cost of packaging material: Another variable with positive or negative expectation on seller's decision to package. This is because a cedi increase in the cost of packaging material will directly affect the variable cost, selling price of the product which in returns will have an impact on their sales or revenue level.

Garrett ranking technique

To find out the constraints associated with Gari packaging in Kumasi Metropolis, the Garrett ranking was used (Sedaghat, 2011). The Gari sellers were asked to rank the constraints given on the questionnaire in the order of severity to their business. Where one (1) means most severe, two (2) means more severe, three (3) means severe in a descending manner. The order of merit assigned by the Gari sellers was converted into ranks using the following formula;

$$\textit{Percentage position of each rank} = \frac{100(Rij-0.5)}{Nj}$$

Where;
Rij = denotes the rank given for the ith factor by jth individual
Nj = donates the number of factors ranked by the jth individual

For each constraint, the response was summed together and divided by the total number of Gari sellers for whom scores were assigned to. These mean scores for all the constraints were arranged in descending order, ranks were given and the most limiting constraints were identified.

RESULTS AND DISCUSSION

Socio economic characteristics of Gari sellers

Table 2: Socio economic characteristics of Gari sellers

Variables	Category	Frequency	Percentage (%)
Age	20 – 30	29	23.7
	31 – 40	50	41.0
	41 – 50	28	23.0
	51 – 60	12	9.8
	61 – 70	3	2.5
Sex	Male	25	20.5
	Female	97	79.5
Marital status	Single	41	33.6
	Married	71	58.2
	Divorced	6	4.9
	Widowed	4	3.3
Educational level	Primary	16	13.1
	Middle school	44	36.1
	Senior high	50	41.0
	Tertiary	12	9.8
Religion	Christianity	92	75.4
	Islam	16	13.1
	Traditionalist	3	2.5
	Others	11	9.0
Ethnic affiliation	Akan	67	54.9
	Ga	16	13.1
	Ewe	10	8.2
		29	23.8

Source: Field Survey, 2021

The minimum age of the respondents is twenty (20) years, the maximum age is sixty-three (63) years and the average age of the respondents in the study area is thirty-eight (38) years. This clearly indicates that there are more matured people who are involved in the Gari business. This means that Gari business is dominated by people in the economically active population bracket age group of 20 to 65 years in the study

area. This is consistent with observations made by Boateng et al., (2013) that economically active age group in Ghana is between 14 and 66 years.

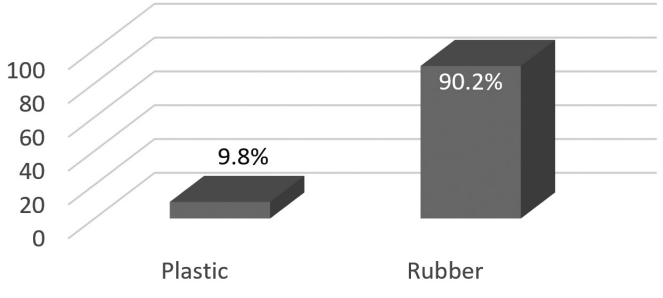
It was found that Gari selling as a business in the Kumasi Metropolis is female dominated. This is because, out of the hundred and twenty-two (122) respondents interviewed, ninety-seven were females, representing 79.5% of the total sample whereas 25 males are into the Gari business representing 20.5%. This gender composition of the study is consistent with the national figures, where 50.48% of the population constitutes females while 49.52% is male (FAO, 2012) and also the active role of women in the cassava industry and their predominance in the processing and marketing than their male counterparts who dominate in the production of cassava roots. (Adegeye et al., 1999)

Majority of the respondents (92) were Christians representing 75.4% of the sample, this is in conformance with the 2010 census which shows Christianity as the largest religion in Ghana with approximately 71.2% of the population being members of various Christian denominations and Kumasi being the second largest town dominated by Christians (Ghana, The Fact Book, 2014).

It was realized that majority of Gari sellers which represents 58.2% of the population are married and 34% are single. The educational level of Gari sellers was categorized into five groups; primary, middle school, secondary, tertiary and no formal education. Sixteen (16), forty-four (44), fifty (50) and Gari sellers had primary, middle school, secondary education. The corresponding percentages are 13.1%, 36.1%, and 41.0%. Sellers with different educational backgrounds go into Gari business with the least category being those with primary education. This implies that most Gari sellers are literates, thus, they are able to read about new technologies that can improve Gari packaging. Gari sellers within the study area belong to various ethnic groups. The ethnic groups were categorized into four (4) groups namely; Akan, Ga, Ewe and others. From the data collected, majority (55%) of the Gari sellers within Kumasi Metropolis are Akans.

Form and extent of Gari packaging

Figure 1: Forms of Gari packaging

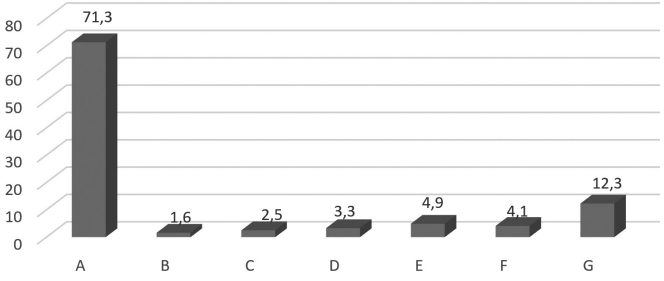


Source: Field Survey, 2021

It was found that out of the 122 respondents, 12 sellers representing 9.8% used plastic whiles the remaining 110 sellers representing 90.2% used rubber as a form of packaging material.

Extent of Gari packaging

Figure 2: Extent of Gari packaging



Source: Field Survey, 2021

The extent of Gari packaging was categorized into seven (7) different groups as follows:

A = Only container/packaging material (e.g. rubber, plastic)

B = Container and name of manufacturer

C = Container, name of manufacturer and product composition

D = Container, name of manufacturer, product composition and location of business

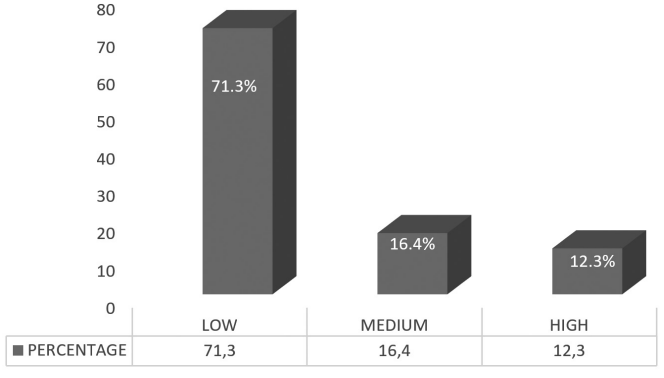
E = Container, name of manufacturer, product composition, location and nutritional benefit

F = Container, name of manufacturer, product composition, location, nutritional benefits and expiry date

G = Container, name of manufacturer, product composition, location, nutritional benefits, expiry date, barcode and mode of usage and storage

From the Figure 2, it was found that majority (71.3%) of the Gari sellers in Kumasi Metropolis use only container (packaging material) without any further proper identification with only container or packaging material whiles the least extent was category (B) with only two (2) respondents representing (1.6%).

Figure 3: Choice of Gari packaging



Source: Field Survey, 2021

The extent of Gari packaging was further categorized into three (3) different levels to ascertain the factors that influenced sellers' choice of packaging Gari (Figure 4.3). The lower level represents only container/packaging material (e.g.

rubber, plastic), the medium level represents container, name of manufacturer, product composition, location and nutritional benefit and the higher level represents container, name of manufacturer, product composition, location, nutritional benefits, expiry date, barcode and mode of usage and storage. The lower level with packaging material without any additional information constituted 71.3% of the total sample. The medium level with additional information like name of manufacturer, product composition, location and nutritional benefit had 20 respondents representing 16.4% of the total sample and the remaining 15 respondents of the sample who were able to package their Gari to meet the required standard set by law backing product packaging constituted 12.3% of the sample.

Costs and returns analysis on Gari packaging

Variable cost items in Gari packaging

The cost and returns analysis shows the cost incurred and revenue generated by Gari sellers who are into selling of packaged and unpackaged Gari in one production cycle (monthly) in the study area. Data on the cost and return items of the individual sellers were collected and categorized into packaged and unpackaged. Hence, analysis was made on the kilogram scale basis to know the respective average costs and returns for each scale of production that sellers were operating. The total cost of Gari selling consists of fixed and variable costs. But this study seeks to consider only variable cost items in Gari selling to avoid bias representation of information. This is because, during our field interviews it was found out fixed cost items in the Gari selling are not specifically assigned to only Gari selling but other ventures as well. The revenue generated was obtained from sales from the product (Gari). This was calculated by multiplying the unit price by the number of kilograms/ Gari produced per production cycle (mothly).

Variable cost is cost which vary as the size and/or level of output of an activity varies, which is also known as direct cost such as raw product (Gari), cost of packaging material, labour, transportation, labeling. The costs of inputs for each scale of production are shown below in the Table 3.

Table 3: Variable cost per production cycle of Gari packaging

VARIABLES	MIN	MAX	MEAN	STD. DEV.
PACKAGED				
Raw Gari (Raw material)	360	3120	1658.28	26.21
Quantity purchased/ packaged (bag)	2	12	7.46	2.56
Purchasing cost	180	260	222.29	23.65
Selling price (2kg)	10	18	14.26	1.92
Cost of packaging material	12	25	17.39	3.37
Labour (production cycle)	10	300	64.74	63.10
Transportation	10	35	18.78	5.48
Labeling	.20	1	0.54	0.28
UNPACKAGED				
Raw Gari	360	7500	1886.90	25.19
Quantity purchased (bag)	2	30	8.89	4.76
Purchasing cost (bag)	180	250	210	20.44
Selling price (2kg)	8.00	12	9.70	0.75
Rubber	1.50	5.0	2.85	0.69
Labour (loading & offloading)	3.0	30	13.00	8.06
Transportation	10	60	23.84	8.06

Source: Field Survey, 2021

Returns on production

Average output per production

The average output per production cycle was calculated by summing all quantities purchased and dividing it by the number of respondents.

Average return per cycle of Gari production

The average return was calculated by multiplying the average quantity of output purchased by the average price per kg of Gari.

Income statement

The income statement presents a summary of the average cost and returns to Gari packaging in the production cycle. It reveals the gross income, total variable cost, as well as their margins. Profitability is the primary goal for most business ventures. Without profit, the business will not survive in the long-run. Consequently, measuring current and past profitability and projecting future profitability is very important (Hofstrand, 2006).

Table 4: Cost and returns for packaged and unpackaged Gari sellers

Particulars	Packaged	Unpackaged
	GH₵	GH₵
Income (A)	3513.93	2847.55
Less Variable Cost		
Raw Gari	1858.28	1866.9
Packaging material (Rubber)	129.73	25.34
Labour	64.74	13
Transportation	18.78	23.84
Labeling	132.94	0
Total Variable Cost (B)	2204.47	1929.08
Gross margin (A-B)	1309.46	918.47
Gross Margin percent of Income [(A-B)/A]*100	37%	32%

Source: Field Survey, 2021

For the packaged and unpackaged Gari, packaged Gari had average total variable cost of GH₵ 2204.47 as compared to the average total variable cost of 1929.08 for unpackaged Gari which represents 100% of the total cost for both ventures since the study considers only variable cost. The raw Gari accounted for the high value of the variable cost representing about 84% and 97% of the average total variable costs for the packaged and unpackaged Gari respectively. With regards to the above percentages, it can be concluded that, raw material (Gari) cost constitutes the majority of the variable cost items for both packaged and unpackaged Gari business in the study area.

Table 5: T-test to compare the means of profit of packaged and unpackaged Gari

Variable	Packaged	Unpackaged	Mean difference	P value	t-value
Profit	1509.46	918.47	590.87	0.000	5.52

Significant at 1%
Source: Field Survey, 2021

The T-test was run to show whether there is a significant difference between the means of the profit of packaged and unpackaged Gari. Our null hypothesis was that there is a significant difference between the means of profit of packaged and unpackaged Gari. Thus, from the results in Table 5, there is much evidence to accept the null hypothesis as the difference was significant at 1%.

Sellers' perception on Gari Packaging

Table 6: Sellers' Perception on Gari Packaging

Perception statements	Strongly Agree (2)	Agree (1)	Neutral (0)	Disagree (-1)	Strongly Disagree (-2)	Mean Score
The success of foreign made products as compared to their locally made counterparts is as a result of their good packaging	30(24.6)	37(30.3)	47(38.5)		1(0.8)	0.72
The element of packaging material like colour, shape, material used, typography influences consumer product choice the most	29(23.8)	41(33.6)	36(29.5)	(-1)	2(1.6)	0.66
The quality of the product in the long run is influenced by the durability of the packaging material used	7(5.7)	22(18.0)	56(45.9)	21(17.2)	16(13.1)	-.14
The safety of a product is determined by its packaging material	45(36.9)	46(37.7)	24(19.7)	6(4.9)	1(0.1)	1.05
Packaging increases the shelf life of a product	47(38.5)	43(35.2)	27(22.1)	3(3.3)	1(0.8)	1.11
Packaging material perception index						**0.68**
The extent of locally packaged products impress consumers most	32(26.2)	28(23.0)	42(34.4)	19(15.6)	1(0.8)	0.58
The extent of packaging influences the purchasing decision of consumers	33(27.0)	44(36.1)	35(28.7)	7(5.7)	3(2.5)	0.80
Consumers perception on packaging determines the extent of a seller's decision to package	19(15.6)	26(21.3)	46(37.7)	24(19.7)	7(5.7)	0.21
Seller's perception index on consumers purchasing decision						**0.53**
Packaging directly influences the sales of a product	36(29.5)	39(32.0)	29(23.8)	14(11.5)	4(3.3)	0.73
Packaging is the driving tool for high patronage of locally made products	33(27.0)	33(27.0)	27(22.1)	18(14.8)	11(9.0)	0.48
Locally made products are not patronized as a result of its poor packaging nature	29(23.8)	39(32.0)	30(24.6)	19(15.6)	5(4.1)	0.56
Ignorance of packaging importance has a direct effect on low patronage of locally made products	24(19.7)	30(24.6)	54(44.3)	14(11.5)	0(0)	0.52
Packaging has a direct relationship with profit	64(52.5)	35(28.7)	20(16.4)	3(2.5)	0(0)	1.31
Perception index on sales						**0.72**
Product price is determined by its packaging	76(62.3)	40(32.8)	6(4.9)	0(0)	0(0)	1.57
Materials for packaging has a direct relationship with the high price of the product	29(23.8)	61(50.0)	26(21.3)	3(2.5)	3(2.5)	0.90
Perception index on price						**1.23**
Product packaging is basically done because it is a legal requirement	46(37.7)	24(19.7)	24(19.7)	20(16.4)	8(6.6)	0.65

Packaging is a tool for product differentiation	56(45.9)	34(27.9)	27(22.1)	4(3.3)	1(0.8)	1.15
Product packaging solely displays the content of the product	10(8.2)	29(23.8)	40(32.8)	29(23.8)	14(11.5)	-.07
Numerous packaging constraints has a direct influence on poor packaging of locally made products	39(32.0)	45(36.9)	20(16.4)	17(13.9)	1(0.8)	0.85
Perception index on the other statements (legal requirement, product differentiation, product display, constraints)						**0.64**
TOTAL PERCEPTION INDEX						**0.76**

Source: Field Survey, 2021

The Gari sellers were asked to give their perception about some statements relating to the packaging of Gari for business success based on five main perception statement categories: packaging material, seller's perception on consumers purchasing decision, perception on sales, perception on price and others. Gari sellers' responses with respect to the various perception statements are presented in Table 6 below. The results show that the mean perception index for the packaging material was 0.68 suggesting that the Gari sellers' had an agreeing perception in terms of packaging material having a positive effect on product quality and differentiation. The mean perception index for sellers' perception on consumer's purchasing decision was 0.53 indicating that the Gari sellers had an agreeing perception about consumer's purchasing decision influenced by the packaging of the product. The positive perception can be attributed to the fact that, they regard packaging as an important tool to be kept as an economic asset.

Gari sellers further agreed with a mean perception index of 0.72 and 1.23 for sales and price respectively indicating their total agreement with the perception statements on sales and price. Lastly, other perception statement like packaging as a legal requirement, as a tool for product differentiation and displaying the product content had a mean perception index of 0.64 indicating their agreement with the perception statements.

The overall mean perception index was 0.76, indicating that the sellers had an agreeing perception on packaging as a tool for product success. But the respondents expressed their dissatisfaction with consumers' negative perception on packaged Gari because they consider it as a low cost product which does not need to be packaged.

Table 7: Descriptive statistics on independent variables included in the model

VARIABLES	**CONTINUOUS VARIABLES**			
	Minimum	Maximum	Mean	Std Deviation
Years of formal education	6	16	10.62	2.66699
Years of selling experience	1	20	6.80	4.42315
Quantity purchased	2.00	30	9.16	4.42532
	1.50	25	5.62	6.60692
Cost of packaging material	**DUMMY VARIABLES**			
	YES		NO	
	Frequency	percentage	Frequency	percentage
Legal requirement	70	57.4	28	23
Product safety	91	74.6	7	5.7
Shelf life	90	73.8	4	3.3
Durability of packaging material	29	23.8	37	30.3

Source: Field Survey, 2021

Table 7 shows the summary descriptive statistics for the variables included in the model. Out of the 122 respondents, the minimum years of sellers' with basic formal education level was 6 and maximum of 16 years representing sellers' with tertiary education level. The minimum years of selling experience was 1 and a maximum of 20, minimum quantity purchase of 2 bags which is equivalent to 132kg and a maximum quantity purchased of 30 bags representing 1980kg of Gari. The minimum cost of packaging material was GH₵1.50 and a maximum of GH₵25 per production cycle (1 month).

In addition, 70 respondents out of the total sample for the study representing a percentage of 57.4 agreed (Yes) to the perception that packaging is done because is a legal requirement and 28 respondents representing a percentage of 23 disagreed (Otherwise). 91 respondents representing 74.6% agreed to the perception on product safety and 7 representing 5.7% disagreed whiles 90 respondents with a percentage of 73.8 agreed to the perception statement that packaging increases the shelf life of a product and 4 respondents representing 3.3% disagreed. Respondents of 29 representing 23.8% agreed and 37 representing 30.3% disagreed with the perception statement on durability.

Determinants of Gari packaging using binary logistic regression model

Table 8: Determinants of Gari packaging

Decision to package					
	Coefficient	Z	Marginal effect (dy/dx)	P>z	SE
Years of selling experience	-0.08	-0.96	-0.00	0.34	0.08

Years of education	0.23**	2.01	0.03	0.04	0.12
Quantity purchased	-0.05	-0.67	-0.01	0.51	0.07
Legal requirement	-0.53**	-2.07	-0.06	0.04	0.25
Product safety	0.44	1.15	0.05	0.25	0.38
Shelf life	-0.05	-0.14	-0.00	0.89	0.32
Durability of packaging material	0.66**	2.16	0.08	0.03	0.30
Cost of packaging material	.019***	3.78	0.01	0.00	0.05
Constant	-3.94			0.01	1.58

*Number of obs = 122 ***, ** Sig @ 1% and 5%.*
Prob>chi2= 0.0000 Pseudo R2 = 0.37
Source: Field Survey, 2021

Using the binary logistic regression model where decision to package was categorized into two (1 representing decision to package and 0 otherwise), sellers' decision to package was regressed against the socioeconomic variables.

From Table 8, all the independent variables were in conformity with the a-priori expectations. This means that as the years of education of a seller increase, the seller's decision to package also increases. Legal requirement which has a negative marginal effect with regards to the decision to package means that as the legal requirements on Gari packaging increases, the decision to package also decreases. From the table, four of the independent variables were statistically significant. Years of education, legal requirement and durability of the packaging material were significant at 5% whereas cost of packaging material was significant at 1%.

The marginal effect of the years of education of a seller means that a year increase in a seller's education will increase the seller's decision to package by 3%. This is concluded that, the higher the years of education of a seller, the higher their decision to package. This can be attributed to the fact that, sellers with higher number of years of education have better understanding on packaging requirement and technique.

The coefficient of legal requirement means that strengthening of packaging laws will increase the seller's decision not to package by 6%. This is because as the law backing Gari packaging is strengthened sellers will be required to increase their extent of packaging to the required standard, but because of the constraints of lack of technical know-how, cost of capital equipment and lack of knowledge on the packaging material or equipment sellers may not be able meet the standard which may trigger their decision not to package.

The coefficient of durability of the packaging material given also means that an increase in the quality of the packaging material will increase the seller's decision to package by 8%. Meaning an increase in the durability of a packaging material will have a positive marginal effect on the sellers' decision to package because, the durability of the packaging material will determine the price of the Gari which will eventually determine the net sales and gross profit of the production.

The coefficient of cost of packaging material also means that a cedi increase in the cost of the packaging material will increase the seller's decision to package by 1%. Meaning a cedi increase in the cost of packaging material will have a positive marginal effect on the sellers' decision to package because, the cost of the packaging material will determine the price of the Gari which in returns will eventually determine the net sales and gross profit of the production.

The Pseudo R2 of 37% means that the significant variables; Years of education, Legal requirement, Durability of the packaging material and cost of packaging material will affect the sellers' decision to package by 37%.

Choice of packaging using the multinomial logit model

Table 9: Choice of Packaging using Multinomial Logit Regression

Choice of packaging	Coefficient	Z	Marginal effect (dy/dx)	P>z	SE
0	**(Baseline)**				
1 (medium level)					
Years of selling experience	-0.04	-0.44	0.01	0.658	0.08
Years of education	0.13	1.06	0.03	0.291	0.12
Quantity purchase	-0.01	-0.18	0.00	0.855	0.08
Legal requirement	-0.54*	-1.85	-0.08	0.064	0.29
Product safety	0.56	1.26	-0.06	0.207	0.44
Durability of packaging material	0.71**	2.09	0.09	0.036	0.34
Cost of packaging material	0.18***	3.52	0.02	0.000	0.05
Constant	-3.96			0.003	2.15
***, ** & * Sig @ 1%,5% and 10% respectively					
2 (high level)					
Years of selling experience	-0.24	-1.57	0.01	0.12	0.15
Years of education	0.48***	2.78	0.03	0.00	0.17
Quantity purchase	-0.11	-1.00	0.00	0.32	0.11
Legal requirement	-0.59*	-1.70	-0.08	0.09	0.35
Product safety	0.08	0.15	-0.06	0.88	0.54
Durability of packaging material	0.59	1.49	-0.09	0.14	0.39
Cost of packaging material	0.20***	3.32	0.02	0.00	0.06
Constant	-6.36			0.00	2.14
***,* Sig @ 1% and 10%					

Number of obs = 122 Pro>chi2 = 0.00 Pseudo R2 = 0.33

Source: Field Survey, 2021

Using the multinomial logit model where choice of packaging was categorized into three (3) namely low (0), medium (1) and high (2) levels of packaging with the low level as the baseline. This model was used in addition to the binary logit model because the dependent variable here is nominal which allows for a dependent variable with more than two (2) categories and it's also considered as an extension of the binary logit model.

From Table 9 (medium level), it can be seen that durability of the packaging material has a 9% increase on a seller's choice to package at the medium level however, it is insignificant in high level. Amongst the other significant variables in each level (medium and high), it is quite clear that an additional increase in the years of education of a seller will have a 3% increase on the seller's choice of packaging at a high level. Legal requirement which is significant at both levels will have between 8% decrease on a seller's choice of either the medium or high level of packaging. Whereas cost of the packaging material has a 2% increase on the seller's choice to package at both medium and high levels.

Constraints faced by Gari Sellers

Table 10: Constraints faced by Gari Sellers

Constraints	Total	Mean	Rank
Lack of technical know-how	10132	83.05	1st
Capital equipment	10015	82.09	2nd
Lack of knowledge of the materials and or packaging requirements	7212	81.80	3rd
Time constraints	9912	81.25	4th
Access to packaging materials and equipment	9798	80.31	5th
Cost of packaging materials	9612	78.79	6th
Low consumer patronage	9560	78.36	7th
Price fluctuation	9382	76.90	8th
Lack of information on packaging	9198	75.39	9th
Environmental issues	8896	72.92	10th
Inadequate storage facilities	8810	72.21	11th
Pricing pressure from consumers	8788	72.03	12th
Transportation	8782	71.98	13th
Material handling	8778	71.95	14th
Labour	8748	71.70	15th
Space constraints	8740	71.64	16th

Source: Field Survey, 2021

Constraints are considered as any factors or elements that work as bottlenecks or obstacle that restrict an entity, project, or system (Such as a manufacturing or decision making process) from achieving its potentials or goals (Mboge, 2015). Some of the constraints such as cost of packaging material, transportation, environmental issues, lack of technical know-how, material handling, lack of knowledge of the materials and /or packaging requirements, low consumer patronage, labour, pricing pressure from consumers, capital equipment, space constraints, time constraints and inadequate storage facilities were identified through literature and were confirmed by our various respondents. Price fluctuation, lack of information and access to packaging materials were amongst the least constraints realized on the field.

Data collected from respondents was analyzed using the garret ranking technique where total scores obtained from the respondents based on the constraints were divided by the total number of respondents (122) to get their respective mean scores. The resulting mean scores were ranked in a descending order with the first (1st) position being the most limiting factor or severe constraint which affects packaging. The results in Table 10 show that lack of technical know-how, capital equipment and lack of knowledge of the materials and/or packaging requirements were the most limiting constraints faced by the Gari sellers which rank 1st, 2nd and 3rd respectively with material handling, labour and space as the least constraints faced by sellers ranking 14th, 15th and 16th.

CONCLUSIONS

The study shows that Gari packaging is categorized into two forms with rubber recording the highest number of 110 representing ninety percent (90.2) as compared to plastic of 12 in number representing ten percent (10%) of the total respondents. The study also shows that the choice of Gari packaging can be categorised into three (3) different levels with low level having the highest frequency with a percentage of 71.3, medium having 12.3% and high level with 16.4%. The empirical results also show that the Gari selling as a business is profitable when well packaged and unpackaged, however the packaged Gari is more profitable since it has a gross margin of 37% greater than that of the unpackaged Gari which has a gross margin of 32%, giving a difference of 5%. The T-test results show that there is a statistically significant difference between the profit of the packaged and unpackaged Gari at 1%.

The mean perception for the packaging material, sales, price, and seller's perception on consumer's purchasing decision and the other perception statements are 0.68, 0.72, 1.23, 0.53 and 0.64 respectively. The study also shows a total perception index of 0.76, which indicates the seller's agreement with regards to the perception statements. It can also be concluded that the cost of packaging material, durability and years of education are the significant factors that affect seller's decision to package. Lack of technical know-how, capital equipment and lack of knowledge of the materials and/or packaging requirements are the most limiting constraints faced by the Gari sellers with material handling, labour and space as the least constraints faced by sellers.

From the study, the following recommendations are given: the profit margin in the study shows that, both ventures are profitable. Hence, investors are encouraged to invest in the Gari packaging business since it has a relatively higher rate of returns as compared to the unpackaged one as their profit difference is statistically significant. Periodic packaging training and seminars for all sellers in the Gari industry should be held to educate them on current trends, do's and don'ts of the industry as well as formulate appropriate packaging laws well-tailored towards improving made-in-Ghana Gari to meet international standards. The study showed that majority of the sellers package their Gari in an unstandardized way (lower level), this has negative implications on both sellers and consumers (Oluwamukomi and Adeyemi, 2015) therefore there is a need for sellers to package their Gari in a standardized way (higher level).

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ANALYSIS OF CONSUMER BEHAVIOUR IN THE EUROPEAN POULTRY MEAT MARKET

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Abstract: *This research has also confirmed that poultry meat is currently in its golden age, not only in our country but also globally. The beneficial physiological effects of poultry meat, its nutritional value (high protein content), and its role in modern nutrition and diets have made it the most popular and 'fashionable' meat product of our time. Healthiness as a megatrend has favoured the consumption of poultry meat, which has been consumed for decades, and is reflected in the growth in production, trade and consumption. The trend of environmental awareness has also pushed the meat market towards the consumption of poultry meat as it is one of the least environmentally intensive compared to other meat types. Poultry meat is the second most commonly consumed meat in the EU, but in some European countries, it has taken over the overall lead (e.g. Hungary, Cyprus, and the UK). Poultry is not only preferred for its healthiness and low environmental impact, it is also an easy, versatile, quick-to-prepare, cheap source of protein. These advantages are expected to lead to further growth in the future in terms of production, trade and consumption, China, the US, the EU and Brazil dominate the poultry sector.*

Keywords: *poultry meat, consumption, trends, consumer behaviour*
(JEL code: Q13)

INTRODUCTION

Population growth creates an ever-increasing demand for food consumption (UN, 2021; FAO, 2022), together with an increase in average per capita incomes; will result in higher pressure on natural resources and biodiversity (Foley et al., 2011). Meat consumption in Europe will still increase slightly in the next decade (Statista, 2020; EC, 2021), but only the type of meat preferred by consumers will change (EC, 2022A).

The only type of meat where average consumption is expected to increase is poultry (OECD – FAO, 2022), which mainly affects the chicken, but also the turkey sector. Concerns about health, animal welfare and environmental protection also shift consumption towards poultry meat (Statista, 2020; EC, 2022A). Among the new trends, we find the possibility of plant-based nutrition, as a result of which the number of flexitarians, vegetarians and vegans is increasing (EC, 2018; Statista, 2020). This may be the most limiting factor for poultry meat.

Another increasingly strong consumer trend nowadays is producing meat with animal welfare in mind. Eating organic food has become 'trendy', especially among younger generations, as part of their lifestyle that focuses on health and wellness/wellbeing (Kiss et al., 2015; Statista, 2020). Poultry accounts for the majority of the European Union's organic livestock, with around 60 million animals (FIBL - IFOAM, 2022), and the frequency of consumption of organically produced chicken was highest in the USA (27.7%) and EU (24.4%) in 2018, (Statista, 2019). In addition, consumers attach more and more importance to the origin of meat, and the way it is kept in accordance with animal welfare standards, they prefer quality consumption over quantity, and they are moving from consuming fresh meat to processed meat products (EC, 2018).

The importance of the poultry sector in modern times is unquestionable since poultry products have become a basic food product (Huszka, 2017; Vincze and Lendvai, 2012) not only in Europe but in many countries of the world. The reason for this is that many components of these meats have a positive effect on our body from a nutritional and physiological point of view (Huszka, 2017), and compare with other types of meat, poultry is considered a cheaper type of meat.

MATERIALS AND METHODS

For this publication, we used qualitative methods such as document analysis, which is a research method that allows us to analyse a material, a written text, by taking into account its entire content and drawing conclusions from it. We also reviewed international statistical databases on the subject (OECD-FAO, United States Department of Agriculture - USDA, European Commission, Statista, Faostat), as well

as national statistical websites, reports, and other documents (e.g. publications, studies, reports, etc.). By analysing the used statistical sources, documents, results, reports and experiences, we formulated the causal links, then concluded and finally made recommendations for the stakeholders in the sector. Many sectoral analyses and studies have been conducted using similar methodologies (Tikász et al., 2008; Szakály et al., 2009; Szigeti et al., Nábrádi et al., 2011; 2014; Kiss et al., 2016; Vida and Szűcs, 2020).

The aim of the current research is to provide an overview of the situation of poultry meat consumption in Hungary and Europe, its consumption patterns and trends.

RESULTS AND DISCUSSION

The global poultry/chicken market has expanded rapidly, particularly over the last 30 years, due to significant modernisation and automation, as well as higher genetic productivity. In addition, the per capita consumption of chicken has increased due to these trends (Research & Markets, 2023).

The global poultry market was worth $352 billion in 2022, and it grew to $378.84 billion in 2023, in 2027 is expected to grow to $487.39 billion. In 2022, it was the second largest segment within the meat, poultry and seafood market accounting for 23.3%. Asia-Pacific was the largest region in the poultry market in 2022 and Western Europe was the second-largest region (The Business Research Company, 2023).

To describe the poultry sector, first, we need to look at world production, trade and consumption data to identify the main countries (Table 1.). The production of poultry meat is almost 139 million tons in the world. According to the FAO, 2022 statistics, the leading poultry meat producers countries in 2022 were China (24.2 million tons), the US (23.3 million tons), Brazil (15.6 million tons) and the EU (13.3 million tons). These countries give the 55% of the world's poultry production. Total world imports of poultry meat amount to 14.8 million tonnes. The largest importers are China (1.8 million tons), Japan (1.3 million tons), Mexico (1.1 million tons) and the UK (0.9 million tons), they cover one-third of total imports. Exports are slightly more than imports, at 16 million tonnes worldwide. The main exporting countries are Brazil (4.9 million tons), the US (3.9 million tons), the EU (2.2 million tons) and Thailand (1.2 million tons). These four countries account for more than 76% of world exports. Consumption is highest in China (25.3 million tons), in the US (19.3 million tons), in the EU (11.7 million tons) and in Brazil (10.7 million tons). We can conclude from the data that China, the US, the EU and Brazil dominate the poultry sector.

Table 1. Leading countries in poultry production, consumption and trade 2022

	Production – thousand tons	Consumption – thousand tons	Export – thousand tons	Import – thousand tons
1	China – 24 200	China – 25 300	Brazil – 4 900	China – 1 800
2	US - 23 300	US – 19 300	US – 3 900	Japan – 1 300
3	Brazil - 15 600	EU – 11 700	EU– 2 200	Mexico – 1 100

Source: Authors' own compilation based on FAO, 2022 data

Within the EU, the main poultry meat-producing countries are, in descending order, Poland, Spain, France, Germany, Italy and the Netherlands. The EU's main export destinations are the UK, Ghana, Congo, Ukraine and Saudi Arabia, and its main import partners are the UK, Brazil and Thailand (EC, 2023).

We should definitely mention that the poultry market is segmented. The main types of poultry are chicken, turkey, ducks, and other poultry. According to The Business Research Company, 2023 report in 2019 the total poultry sector is divided into 87.9% of chicken, 6% of turkey, 3.7% of duck and the remaining value from other poultry sales segments (The Business Research Company, 2023). In 2022, also chicken meat dominates the poultry sector, the production volume was 101 million tons (USDA, 2023). In the case of chicken the main producing and consuming country was the US (20.8 million tons). In production China and Brazil have the same level, more than 14-14 million tons. These three countries account for 49% of the total production. US, China and EU consumption account for 42% of total world chicken consumption. The main chicken meat exporters are Brazil and US, the main importers are Japan, Mexico and China.

In the turkey sector of the 6 million tonnes of turkey meat produced in the world in 2020, the USA will have the largest share with 44%, followed by Brazil with almost 10%, then the EU countries with 32%. Hungary is the 12th largest producer of turkey meat in the world with a 1.36% share of the global market, according to FAOSTAT, 2022. In 2020, 82% of EU poultry meat production was broiler chickens, 14% turkeys, 3% ducks and 1% other poultry (EC, 2022B).

According to OECD – FAO, 2021; FAO, 2022; AVEC, 2022; EC, 2022A; USDA, 2023 forecasts, the amount of poultry meat produced and consumed in the European Union will increase in the future. Consumers are attracted to poultry because of the lower prices, the stability and adaptability of the product, and the higher protein and lower fat content. Poultry meat consumption worldwide is projected to increase to 152 million tonnes over the forecast period. The projected strong growth rate in per capita consumption reflects the important role poultry meat plays in the national diets of many populous developing countries, including China and India (OECD – FAO, 2021).

World poultry consumption per capita was 14.8 kg in 2019-2021 average. Global per capita consumption of poultry is projected to by 2031, rising to 15.8 kg/capita/year. Compared to 161 countries, Israel has the highest per capita consumption of poultry meat in 2020 at 68.9 kg, and Chad has the lowest at 0.48 kg. The per capita poultry consumption in the EU was 23.5 kg in the same period which will increase to 25.2 kg by 2031 (OECD - FAO, 2022), so poultry will remain our second most consumed meat product in Europe.

Within the poultry meat consumption, the per capita consumption of turkey meat is slightly but decreasing in the EU member states, it was 4.1 kg by 2020. The Germans had the most significant per capita consumption in 2020 (5.8 kg), followed by the French (4.5 kg), and the Austrians in third place (4.4 kg). The EU consumption is lower compared to the US per capita consumption of turkey meat, which was 7.1 kg/capita/year in 2020, which decreased slightly from 7.5 kg/capita/year in 2016 (AVEC, 2021). In the EU, poultry meat is the only meat type whose per capita consumption will increase in the future. This growth is driven by the continuing change in consumer habits, which is benefiting poultry meat. The increase in per capita consumption is due to the healthier image of poultry meat compared to other meats (in particular pork), it's easier preparation and the fact that it is not affected by any religious restrictions on its consumption (Vida and Szűcs, 2016; EC, 2021; EC, 2022A). Migration is also contributing to the shift in meat consumption towards poultry meat (EC, 2018). In recent years, the COVID-19 epidemic has changed our dietary and consumption habits (Keller and Huszka, 2021, Huszka et al., 2022), bringing with it many new restrictions and strict regulations that have affected our entire lives (Vida and Popovics, 2020).

Table 2: The kilogram per capita meat consumption by meat type in Europe (2020)

Countries	Poultry	Beef	Sheep and goat	Pork	Other meats	Fish and seafood	Total meat consumption
Albania	11,71	13,20	8,68	6,56	0,56	8,64	49,35
Austria	17,72	16,04	1,15	46,69	0,58	13,89	96,07
Belgium	12,54	13,00	1,15	32,39	1,89	22,80	83,77
Bosnia and Herzegovina	16,82	10,30	0,61	9,80	0,27	5,84	43,64
Bulgaria	22,78	3,93	1,38	31,61	0,19	7,31	67,20
Croatia	16,57	13,36	1,50	52,96	0,95	18,99	104,33
Cyprus	25,94	6,81	4,96	38,60	0,14	24,57	101,02
Czechia	22,83	10,70	0,33	45,00	1,03	9,28	89,17
Denmark	25,22	24,23	0,73	25,85	0,93	26,54	103,50
Estonia	21,97	9,12	0,48	37,00	0,15	14,66	83,38
Finland	19,82	18,31	0,58	32,71	1,14	33,50	106,06
France	23,39	21,44	2,54	31,92	1,12	34,24	114,65
Germany	18,01	14,49	0,82	42,21	0,87	12,63	89,03
Greece	25,61	14,97	8,49	28,87	1,96	19,62	99,52
Hungary	26,61	4,75	0,15	51,93	0,16	6,34	89,94
Iceland	31,38	15,35	22,05	21,28	2,68	91,18	183,92
Ireland	26,71	20,06	3,43	30,72	0,59	22,82	104,33
Italy	18,76	16,75	0,88	37,82	1,19	29,82	105,22
Latvia	20,96	5,78	0,38	41,57	0,37	24,74	93,80
Lithuania	30,25	5,07	0,45	47,82	0,43	32,59	116,61
Luxembourg	19,34	25,80	1,20	32,20	1,18	31,00	110,72
Malta	25,38	18,86	1,20	24,93	0,21	32,51	103,09
Montenegro	16,42	13,19	2,38	44,72	0,05	14,08	90,84
Netherlands	5,34	16,26	1,03	26,15	3,56	21,91	74,25
North Macedonia	20,03	7,89	0,70	8,88	0,34	6,21	44,05
Norway	20,11	17,23	5,23	24,55	1,52	50,57	119,21
Poland	28,51	1,01	0,03	54,15	0,10	12,44	96,24
Portugal	32,68	18,84	2,34	40,46	1,05	57,19	152,56
Romania	23,85	5,64	2,51	37,48	0,27	8,27	78,02
Russia	31,35	13,15	1,40	27,09	3,39	20,06	96,44
Serbia	12,72	7,24	3,33	38,00	0,23	6,22	67,74
Slovakia	14,79	5,69	0,05	35,71	1,08	9,68	67,00
Slovenia	24,15	14,76	0,89	28,18	0,53	11,96	80,47
Spain	33,34	13,71	2,05	55,21	1,63	42,40	148,34
Sweden	17,10	22,34	1,41	29,50	0,13	32,39	102,87
Switzerland	17,34	20,69	1,48	29,97	1,19	16,71	87,38
Turkey	20,65	13,12	5,39	0,00	0,01	4,77	43,94
Ukraine	27,20	7,76	0,32	17,36	0,45	11,81	64,90
United Kingdom	33,14	16,52	4,45	23,95	0,93	18,50	97,49
EU-27	22,21	14,09	1,48	40,45	1,05	23,86	103,14
World	15,75	8,94	1,97	15,48	0,67	19,75	62,56

Source: Authors' own compilation based on FAOSTAT, 2022

In Table 2, we can see the European country's per capita meat consumption by type in 2020. In Table 2, data refers to meat 'available for consumption', but the actual consumption may be lower after correction for food wastage. The household sector should pay attention to their food-wasting behaviour, and information and marketing campaigns to help them significantly reduce the amount of food waste generated in their households (Balogh, 2010; Vida et. al., 2022). The quantity of food consumed in natural units is one of the most important household food consumption indicators (Balogh, 2008), but often different databases calculate in different ways. In the next table, there are data from the FAOSTAT database, which differ from the data of the Hungarian Central Statistical Office (which contains the actual quantities of meat consumed). FAOSTAT's data is interesting because it allows you to compare the types of available meat in each European countries. According to the FAOSTAT, 2022 the average meat consumption in the world is 62.5 kg/capita/year. In the EU, this value is much higher, more than 100 kg/capita/year. If we analyse the structure of meat consumption, we can say that fish and seafood (19.7 kg/capita/year), poultry meat (15.7 kg/capita/year), pork meat (15.4 kg/capita/year) and beef (around 9 kg/capita/year) are consumed to the greatest extent in the world. The consumption of other types of meat is negligible. The map of average meat consumption in the EU-27 is significantly different. The highest consumption is pork (44 kg/person/year), followed by fish and seafood (24 kg/person/year), poultry (22 kg/person/year) and beef (14 kg/person/year) consumption. Pork consumption is nearly 40% of total meat consumption.

The pork meat – as the most consumed type of meat in the European Union – consumption is the highest in Spain, Poland, Croatia and Hungary. Beef meat consumption is relatively high in Luxembourg, Denmark, Sweden and France. Sheep and goat meat consumption is the highest in Iceland and Albania (due the religious customs). Consumption of fish and seafood is high where geographical conditions allow it (Iceland, Portugal, and Norway) (Table 2.).

Examining per capita poultry consumption by Member State, we found that the highest poultry consumption was in Spain (33.3 kg), the UK 833.1 kg) and Portugal (32.6 kg) and the lowest consumption was in the Netherlands (5.3 kg) and Belgium (12.5 kg).

According to KSH, 2022A, per capita poultry meat consumption in Hungary was 16.5 kg in 2010, rising to 25.2 kg in 2020, an increase of 52.5% in a decade. The increase in per

capita consumption has made poultry meat the leading meat product in Hungary. Analysing the poultry meat consumption by age group in Hungary, we can conclude that the most dynamic increase in per capita poultry consumption in 2020 compared to 2010 was among young people (under 25 years old) (+85%). However, poultry consumption is the highest among people aged 65 and over (33.8 kg/person/year) and lowest among people aged 25-54 years (21.7 kg/person/year). Looking at household composition, poultry meat consumption is highest in households with a majority of elderly people. In relation to educational level, it can be observed that the consumption of poultry meat tends to decrease as educational level increases (Table 3.).

According to KSH, 2022B data, there are significant regional differences in poultry meat consumption: people living in smaller towns consume more poultry meat than people living in urban areas do. The most poultry meat is consumed in the North Great Plain (32.7 kg), South Transdanubia (29.3 kg) and North Hungary (26.8 kg) in 2020, with consumption in these regions exceeding the Hungarian average (25.2 kg). The lowest consumption of poultry meat is in the Central Transdanubian (20.8 kg) region in 2020. These consumption data in Hungary contradict the trend that young consumers in larger urban areas consume poultry meat more. The meat consumption by the type of settlement shows that the highest poultry meat consumption is in the villages (29.6 kg/capita), smaller cities (24.1 kg/capita) in 2020 (Table 4.).

Regional differences in consumption can also be observed in other livestock sectors (Huszka et al., 2008; Fülöp et al., 2009; Vida and Feketéné Ferenczi, 2022). In addition to statistical data, it is also worth looking at primary research studies. A Hungarian study found that the preference for poultry meat depends on the consumer's age and place of residence, with the preference for poultry meat being highest among people aged 50 and over, young people under 34 and those living in cities with county status. People in better financial circumstances consume more poultry meat than people with lower social status (Huszka et al., 2018).

Although turkey meat has many physiological advantages, it is still not a very popular product among Hungarian consumers. According to the latest data, Hungarians consume an average of only 4 kilograms of turkey meat per person per year. This could and should be changed by encouraging consumption, because consumption has stagnated in the past period, one of the reasons for which can be mentioned is that due to the epidemic, factory kitchens and restaurants, where a significant part of turkey consumption was concentrated, were closed (BTT, 2021).

As a general domestic trend, it can be mentioned that, in addition to chicken, more and more people are opening up to turkey, which is good news, since we can make a lot of delicious dishes from different parts of the animal, and it is also considered a particularly healthy ingredient. You can find it pre-packaged on the shelves of all major stores and shops, or at the butcher's counter, and in terms of price, it is not considered a very expensive product (although it is more expensive than chicken in Hungary). If someone is open to a healthy diet or wants to eat other poultry besides chicken, then turkey can be a particularly good choice (Agrárszektor, 2021).

Table 3. The kilogram per capita poultry meat consumption in Hungary by age group, educational level and the type of household

Year	Total	Under 25 years	25-54 years old	55-64 years old	65 years and older	primary or no education	secondary school without graduation	secondary school with graduation
2010	16,5	12,9	14,2	20,4	21,7	19,5	16,4	15,0
2015	19,2	17,8	16,3	24,4	24,9	22,5	20,0	19,4
2016	19,3	16,9	16,9	21,5	26,0	23,7	19,1	18,5
2017	20,0	16,2	17,6	24,2	25,3	23,5	21,2	19,4
2018	20,9	19,3	17,2	25,9	28,6	25,4	21,4	20,3
2019	23,1	20,5	19,3	28,5	31,0	27,9	25,7	22,4
2020	25,2	23,8	21,7	29,4	33,8	31,3	26,3	24,4
Year	higher education	only young people	only middle aged	only old people	only young and middle-aged	only young and old	only middle-aged and elderly people	young, middle-aged and elderly
2010	14,3	11,1	20,3	23,2	13,7	15,0	22,1	13,3
2015	15,4	14,8	23,9	28,4	15,0	14,6	24,5	14,4
2016	16,9	14,2	26,4	27,6	15,4	16,8	20,9	13,5
2017	16,8	19,8	25,6	26,8	16,0	16,6	23,7	15,7
2018	18,0	20,2	27,7	30,8	15,4	24,8	23,9	15,6
2019	18,1	21,8	28,9	32,9	18,1	19,5	26,7	17,4
2020	21,3	26,1	32,1	35,8	18,8	20,8	28,9	23,2

Source: Authors' own compilation based on KSH, 2022$_A$

Table 4. The kilogram per capita poultry meat consumption in Hungary by region and type of settlement

Year	Total	Central Hungary	Central Transdanubian	West Transdanubian	South Transdanubia	North Hungary
2010	16,5	15,1	14,1	13,6	15,4	16,5
2015	19,2	16,0	16,7	14,6	19,9	22,6
2016	19,3	16,4	16,6	13,8	26,1	22,2
2017	20,0	16,5	17,0	13,5	24,7	20,2
2018	20,9	17,6	18,4	14,0	23,4	22,2
2019	23,1	19,9	20,1	16,5	26,1	23,9
2020	25,2	22,7	20,8	22,0	29,3	26,8
Year	North Great Plain	Southern Great Plain	Capital city	County seat, city with county rights	Other cities	Village
2010	19,1	21,7	12,1	16,8	16,7	18,5
2015	24,3	23,0	15,7	18,4	19,5	21,5
2016	22,8	20,8	16,3	18,0	19,6	21,4
2017	24,6	27,2	16,4	18,3	20,1	23,0
2018	28,0	25,4	18,5	19,5	19,8	24,5
2019	31,5	26,1	19,3	20,8	21,9	28,2
2020	32,7	24,6	23,7	21,8	24,1	29,6

Source: Authors' own compilation based on KSH, 2022$_B$

To sum up the consumption analysis, we can conclude, the per capita consumption of poultry in Hungary will increase in the future, so poultry meat consumption is dominant in the consumption of meat types. According to OECD – FAO, 2022, in the long term, per capita poultry consumption in the EU increased by 79% in 2018 (24.4 kg) compared to 1990 (13.7 kg)

- while other meat products have decreased over this period (pork consumption decreased by 4% and beef by 19%) - and this increase will continue in the future. After the analysis of consumption data, a thorough analysis of purchasing habits is needed to see what consumers consider when buying meat. The most important influencing factors for customers when buying food products, such as poultry products, are freshness, texture, hygienic display and then price (Szakály, 2016). In terms of the importance of factors influencing the selection, the healthiness and origin of the products are also important (Huszka and Dernóczy-Polyák, 2015).

The national origin of products is becoming an increasingly powerful factor influencing purchases, with an increasing number of consumers demanding information about the origin of products and their way to the store (Nábrádi et al., 2017), which shows the strengthening of consumer ethnocentrism in poultry consumption. Another survey, which examined the frequency of poultry meat purchases by gender, found that women purchase more of this meat weekly than men do. The increase in the frequency of poultry meat purchases can be associated with higher educational attainment (Szakály, 2016; Huszka et al., 2018).

After analysing the past, it is worth looking at the trends that will determine future purchasing habits. Poultry meat is essentially a product bought through offline channels, but the market for online options will develop afterward. Thanks to the rapid development of technology, food ordering and delivery via computer, mobile phone, or app are on the rise, creating a new market opportunity not only for restaurants but also for everyday shopping.

Both the present and the future are being shaped by health and environmentally conscious consumer groups, which the literature refers to as LOHAS (Lifestyle of Health and Sustainability) groups (Kiss et al., 2018). The new decision-making aspect is most relevant in the food sector, where recent food scandals have highlighted the dangers (Törőcsik, 2007). These trends have already led to the appreciation of free-range, farm-raised, yellow-skinned, high-quality, healthy poultry/chicken meat, which meets the most ethical husbandry requirements, animal welfare standards and consumer demands, and could become a successful product for the poultry industry in the future. It can also be observed that the number of restaurants that offer healthy, modern diet chicken dishes delivered to our homes is increasing. Thus, in addition to the healthy quality of the meal, the need for the comfort function is also satisfied. It is also worth mentioning the use of chicken in fast food restaurants, as it is quite significant, just think of the biggest ones: McDonalds, KFC, Burger King.

Consumers are looking for safe, traceable, healthy and high-quality food. Because of changing production and consumer needs and expectations, poultry farmers in Hungary and Europe have been producing, processing and selling free-range poultry for several years.

Poultry meat has increasingly evolved from a commercial product to a premium food product and is therefore no longer considered a product of the average consumer (Huszka et al., 2018). The demand for poultry products with added value and quality is expected to continue to grow among consumers of premium products (Aliczki et al., 2013; Huszka, 2017).

Regarding meat consumption, Fehér and Szakály, 2017 found that Hungarians are most likely to eat poultry and pork. This is supported by a study on the preference for meat, with chicken (4.68) and pork (4.37) topping the list on a five-point scale (Keller and Ertsey, 2020). Those who like and consume poultry meat consume on average 2.6 times a week (Huszka and Polareczki, 2008).

A representative survey of 1 000 consumers by Szakály (2016) showed that some consumers buy large quantities of poultry meat at once, which they do not prepare fresh but freeze for later use. In research also aimed at the consumption of fresh meat (n=1023), the participants mostly preferred poultry meat, among poultry products, chicken meat, including chicken breast (29.9%), was the most popular, duck meat (0.7%) and turkey meat (2.2%) hardly made any purchases (Huszka et al., 2018). In Hungary, when we talk about poultry meat, it is not equal to chicken meat consumption, but the distribution above also shows that the consumption of other poultry meat (turkey, duck, goose) is not significant. The consumers of chicken and turkey meat are mostly women (Vida, 2013), according to a survey, they prefer to eat chicken dishes on an annual average and according to their opinion, the consumption of chicken and turkey meat reduces the risk of chronic diseases (Nábrádi et al., 2017). Chicken consumers generally prefer chicken with a full, muscular breast and thigh. For this reason, further processed, cut or ready-to-cook products have recently increasingly replaced whole chickens.

Chicken and turkey meat is the preferred animal protein compared to the more expensive beef and pork products. In the context of food inflation and higher energy costs, EU chicken meat consumption will remain strong in 2022 and 2023. While special production schemes including organic, free range and GMO-free chicken are widely supported throughout the EU, sales of inexpensive chicken meat cuts continue to grow faster than sales of more expensive products like breasts and whole birds (USDA, 2022).

Despite the similar position of chicken and turkey, there are significant differences in their purchasing and consumption habits. To be precise, there are significant differences in the frequency of shopping, the place of shopping, the shopping aspects and the preparation methods. There is a positive shift in the direction of turkey meat, but many people are still uncertain about the preparation of turkey meat, so they prefer not to choose it. The consumption of turkey in Hungary corresponds to the EU average consumption (4 kg/person/year). In order to increase consumption, the future of turkey meat lies primarily in cooked products, but fresh meat must also find its place in the meat industry.

After the 2022 peak, EU poultry prices are expected to fall and stabilise (EC, 2022A). When buying poultry meat, consumers try to get the product at a reasonable price, however, it is far from clear that they prefer products available at discounted prices Szakály (2016), but the price is a determining factor when buying poultry (Kincaid, 2018). Consumer loyalty is far from stable, despite the active loyalty programs of some retail chains (Szakály et al., 2020).

Among the offline channels, shopping from the butcher and shopping in hyper- and supermarkets and discount stores should be highlighted as the largest market. We should also mention a market segment that prefers the direct sales channel, i.e. they buy freshly slaughtered, ready-to-cook chicken from home.

The rise of international trade chains is also reflected in the selection of Hungarian poultry products. Consumers typically buy meat products in supermarkets and hypermarkets, mainly asking for fresh meat (78.4%). Discount stores (e.g. Lidl, Penny, Aldi) were chosen by 11.9% and convenience stores by 7.5% (Huszka et al., 2018).

CONCLUSIONS

In world production and trade China, the US, the EU and Brazil dominate the poultry sector. Within poultry, chicken is the most important type of meat, followed by turkey. As the above-mentioned and analysed several research has highlighted, consumers buy poultry meat because they want to eat it in an enjoyable and healthy way. Poultry meat is perfectly suited for this purpose, as it is an easy and versatile meat with a neutral taste, widely consumed and easily integrated into a modern diet, without any concerns about ethical or environmental impact, or religious restriction. The ethical concerns associated with environmentally conscious consumer behaviour do not affect the consumption of poultry meat (especially chicken meat), which is one of the meat types with the lowest emissions, making it a favourable alternative for conscious consumers and flexitarians. Poultry meat is the second highest consumed type of meat in the world (15.7 kg/capita/year). Its global popularity also means that it does not have to face any consumption restrictions from an ethical, environmental or religious point of view. In addition to the above-mentioned advantages, poultry meat is a relatively cheap raw material; nowadays, poultry/chicken meat is an essential source of protein for many nations.

Poultry is the third highest consumed meat in the EU-27, and the most consumed type of meat in Hungary. Forecasts indicate that consumption will continue to follow a similar trend in the future, and that poultry meat will continue to be the leading meat product in the world. In the EU, poultry meat is the only meat type whose per capita consumption will increase in the future. In Hungary, poultry meat retains its additional advantage over other meat types. Within poultry the consumption of turkey meat in Hungary corresponds to the EU average (4 kg/person/year). There is a lot of potential in the turkey, both from the side of production and consumption in Hungary, the European Union and the world. In order to increase consumption, the future of turkey meat lies primarily in processed, pre-cooked food products, but fresh meat must also find its place in the meat industry. Turkey meat should be repositioned among Hungarian consumers, especially from an emotional point of view, as there is some internal emotional resistance among consumers regarding the consumption of turkey meat. They know that it is healthy and reliable, but for some reason they choose chicken instead. White meat is particularly popular with young people, who often reject red meat for environmental, ethical and animal welfare reasons. Turkey meat can be a transition between white meat and red meat in the sense that you can get both types of meat at the same time, depending on which part of the body you eat. The young generation, as the consumers of the future, should be made more open to the consumption of turkey meat, thus creating a long-term culture of consumption in households, as turkey meat has a place on the consumer's table.

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NEW METHODS FOR STRUCTURAL DEVELOPMENT CAUSED BY OPEN INNOVATION IN RED BIOTECHNOLOGY

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Abstract: *Red (pharmaceutical) biotechnology is currently one of the most innovative industries. A good example of this is the fight to develop a vaccine against the COVID-19 pandemic, or even the incredible dynamism of the development of anti-cancer drugs. Innovations always carry uncertainty within them - the authors of this article see and experience this every day during their managerial work related to R&D in the biotechnology sector. Decisions often have to be made on uncertain grounds, with incomplete information. Mapping all these anomalies and their root causes is also necessary according to what has been experienced in various organizations, but at the same time it is a very interesting and challenging task. One of the possible means of sharing and reducing the risk is the so-called Open innovation, which required innovations in the fields of technical, industrial rights protection, privacy protection, but also cooperation platforms. All this required a new organizational and structural operation from the actors. This means that technological innovation attracts and results in project innovations. We assume that organizational development and structural innovations were also achieved through these transfers. We are trying to validate this hypothesis with the help of interviews with professionals. Our thesis: the challenges arising from the special innovation of red biotech also caused and necessitated the innovation of organizational structures and the development of its organizational and structural functioning, to which open innovation gave outstanding help.*

Keywords: *red biotechnology, open innovation, risk-sharing, structural development, organizational innovation, Structure an Operation of Organization (SO&OO)*
(JEL code: O33)

INTRODUCTION

In the case of biotechnology, uncertainty is often interpreted as "ignorance" or "real surprise". "We don't know what we don't know" is the original surprising range of little-known events and hard-to-determine distributions, which is gaining more and more importance, mostly supplemented by irreversibility. [1]

In the field of the drastic reduction of knowledge, sooner or later it is not a matter of uncertainty, but of ignorance, since we do not even know about the existence of the events that will occur, and we may not be able to know, not only about their probability of occurrence [2].

A problem is the not always adequate awareness of the events that become (may) become relevant. For example, if we look at the production of drugs with genetically modified

organisms, drug manufacturers have faced such new problems as the wave-like changes in the social and environmental acceptance of the technology, which has generalized the perception of working with recombinant organisms, regardless of the isolation of the organisms during use. At the same time, "classic" events that influence the behaviour of pharmaceutical companies continue to play a role: e.g. in the background, the intertwining of competitors, building on each other, takeovers, industrial rights protection situation.

At the same time, the "classical" processes that influence pharmaceutical production, such as cooperation and mergers of competing companies in the background, still play a role.

The other concern is probabilities. There are areas where probabilities can be estimated relatively easily (e.g. industrial rights protection), but in other areas very difficult (e.g. feasibility of technologies, changes in regulations, marketability, changes in price, demand, supply). The latter are the areas whose probabilities cannot be generalized from the more classic pharmaceutical or chemical industry examples, they are bio-specific. That is, overall there are probabilities that can be considered unknown. Of course, the most difficult thing is to include the dangers of unknown processes in the decision.

Red (medical) biotechnology is currently one of the most dynamically developing industries. Disruptive innovations in the field appear from time to time, each decision (e.g. the development of a drug) can be worth billions of USD. The pharmaceutical industry is one of the most research-intensive industries, with an average new product development (NPD) trajectory of 11.9 years. [3] So primarily the nature of the industry determines the uncertainty. The nature of the industry results in very long periods of time (on average approx. 10 years from the start of research to the market), very large amounts invested (approx. 1-2 billion USD for new molecules), and extremely strict regulations for the licensing of products.

The reduction of uncertainty can be facilitated by cooperation and division of tasks between companies, thereby supporting open innovation. Nothing exemplifies the importance and topicality of the topic better than a study predicting trends in the pharmaceutical industry published in 2019. According to a study predicting pharmaceutical industry trends, pharmaceutical expenditures worth USD 1.2 trillion in 2018 will reach USD 1.5 trillion by 2023 globally. These huge numbers also indicate the size and importance of the industry [4]. Thanks to the current COVID-19 pandemic, we can see further appreciation of the health industry. Thus, it is easy to see that important economic aspects, including related management-organizational and human resource management aspects, can be discussed in this area.

THEORETICAL BACKGROUND

The development of biotechnology from an economic and strategic decision point of view

Parallel to the development of biotechnology, new requirements were formulated for national innovation systems. The developed countries responded to the new challenges in different ways and with different results. The competitive position of some countries in biotechnology has changed significantly in a relatively short period of time. In the thesis, we looked for an answer to what economic conditions play a decisive role in biotechnology innovation, why individual countries have achieved different successes in the development of biotechnology.

The study of the international development experiences of biotechnology was one of the basic conditions of economic biotechnology research. In the first half of the 1980s, there was plenty of international information available regarding the development of biotechnology, but due to the novelty of the field of activity from an economic point of view, only a small portion of the information was systematized. Therefore, the most difficult part of the research was the economic definition of the special problems arising from the development of biotechnology, and the development of the research method.

The framework of classical economic theory proves to be narrow in the analysis of scientific and technical development, the strictest limitation is the static approach and the assumption of the existence of a pure market. The economics of scientific and technical development served as a reference point for creating the theoretical foundations of the research.

In the modern economy, a high level of vertical division of labor is coupled with innovation, as a result of which the market does not exist in its pure form. If companies' decisions were based only on pure market, quantitative signals (price, volume) in accordance with the postulates of neoclassical economic theory, product innovations would only be realized very rarely. The producers would not have information about the users' needs, and the users would not have information about the use value (quality characteristics) of the new products. The results of empirical studies conducted in developed industrial countries do not support this: product and process innovations have a similar weight in innovations. [5]; [6]

The market serves as a mechanism for discovering new demand, products and processes. Market success - which is an integral part of the performance of companies in the industry - directly contributes to the level and development of companies' market orientation. At the same time, the market expects strategic flexibility at the operational level from the companies involved, under conditions of intense competition and considerable uncertainty. (Yousuf et al., 2020; Yousuf et al., 2021) At the same time, product innovation affects consumer preferences and results in their change. In the market, the so-called "organized" elements play a significant role: apparently independent market players are mutually dependent, in addition to transactions based on price and volume, their relationship is also influenced by quality signals, and it also happens that they cooperate directly. These elements to compete must be integrated in the operation of the companies that must be mirrored in operational flexibility. (Yousuf et al., 2020)

Thus, part of the successful innovations of the producers is based on the knowledge of the needs of the users, but at the same time, an important condition for the spread of the innovations is that the users know the parameters of the new products, on the basis of which they decide on their purchases. Users can also participate in innovation (for example, as customers). Producers' decisions can be influenced not only by users, but also by signals from "external" institutions, the government and public opinion.

The level of organization is different in the market for different products. The degree of organization of the market depends on the complexity and cost of the products, as well as the rate of change of the parameters that form the basis of their value in use. In the market of products that are not complicated and the parameters that form the basis of their value in use change slowly, the market organization is low. The greater complexity of the products and the rapid change in the parameters that determine their value in use necessarily result in a higher degree of organization of their markets. [6]

The theory of economic growth and international trade is based on the assumption that technologies are freely available in all regions and countries, and that new technologies flow freely between countries. However, these assumptions are not in line with the processes taking place in the economy: we examine the appearance and spread of any new technology, some countries always play a leading role in its development, while other countries follow them with more or less delay. [6]; [7]

This trend prevails in scientific and technical development despite the fact that international cooperation and integration have significantly strengthened in the last twenty years, and the autonomy of nations has weakened. Part of the national capital has become international, less and less dependent on national governments and employees. Today, multinational companies play a significant role in national innovation systems. Despite all these conditions, nowadays the national innovation systems of individual regions and countries differ greatly from each other and represent a significant level of economic analysis. [7]

There are different points of view regarding the causes of innovation. The model based on demand pull serves as an argument for the raison d'être of the laissez-faire science and technology development policy: if demand triggers innovation, there is no need for state intervention. At the same time, overemphasizing the science push and recognizing the dominant role of the supply side presupposes state support for R&D and education, as well as the implementation of an active workforce policy. According to the so-called dualistic model, scientific results play a fundamental role in the birth of new technologies, but innovation is directly and strongly stimulated by the development of demand. The main driving force lies not in the volume of demand, but in its quality. It follows from this that the research and development policy should not only cover units located at the beginning of the innovation chain. [8], [6], [9], [10]

At the same time, technical development cannot simply be limited to the "practical implementation" of science, as it also has its own dimension: the scientifically based and socially organized implementation of technology. Alternatives to technological development are determined by the power structures and attitudes prevailing in society. Scientific and technical development is a dynamic adaptation between social and institutional development, the conditions of which are determined and structured by national policies. [11], [12]

The importance of national policies increases in the period of far-reaching innovations. The role of research and development policy becomes especially important due to the following three elements: the complexity of the relationships between institutions interested in innovation (regulation of the institutions' behavior and the use of new procedures, products, etc.); transformation of the content of corporate activity; the formation of new organizational forms (appearance of new activities related to the environment, etc.) [13]. This policy covers the entire system of research-technical development-business exploitation, because there are inputs and outputs at every level of this system (for example, research also affects production through vocational training) [11].

In the last decade, the biotechnology industry, as a potential source of regional and national economic development, has become the focus of growing academic and political interest [14], [15]. A strong innovative character is reflected in the research and development activity, which has a significant impact on performance, financial flexibility and bargaining power at the company level. (Tömöri et al., 2022) (27). Even though the current size of the industry is quite small, especially in terms of the number of employees, both local and international decision-makers – primarily in the United States – are effectively encouraging local and regional investments in the biotech industry. In many cases, politicians' interest in biotechnology is based on the belief that the traditional sectoral sources of employment and investment are subject to increasing destruction due to globalization, and the biotechnology industry is associated with higher earnings and a high level of economic recovery and growth [16]. The uptake of biotechnology investment programs shows an increase in the effectiveness of biotechnology as a driver of regional economic development – even in regions with little current/timely activity in the industry. In addition, these political initiatives will have a long-lasting effect on regional development patterns, as well as on the development and long-term structure of the industry.

Despite the great academic and political interest in the biotechnology industry, the field of application and extent of the industry cannot be precisely defined. The answers depend on which definition of biotechnology we want to use ([17], [18], [19], [14], [20]). In the most general terms, biotechnology is an industry that involves the placement of innovations related to life sciences on health, agricultural and industrial business bases, which are often called the "red", "green" or "white" biotechnology sectors.

While the international biotech industry includes activities from all three biotech spheres, the majority of political and academic studies focus on 'red' (i.e. health) biotechnology. Furthermore, although most private and public biotech ventures are located in the United States, the location of regional and international developments is quite different for red, green, and white biotechs. Despite the ambiguities arising from the industry's application area and the alternation between the three subsectors, "cluster-led" growth in biotechnology has emerged as a key economic development strategy for both regions and nations at all levels of economic and technological recovery. [14], [15]

Research results [21] suggest that biotechnology is a set of clustered economic activities strongly based on its interaction with science-based university research. The growing number of different locations in the United States is leading to a significant level of biotechnology activity, as well as an

increasing number of countries around the world supporting major activities within the biotechnology industry. Even more remarkable, many countries around the world are "embracing" the ever-changing importance of the biotechnology industry. In most countries, the activity is highly localized and often concentrated in a single city or capital area.

Open Innovation

As can be seen from the red biotechnological trends and processes, as well as the IP utilization studies, often only a few years (maximum 10, but sometimes only 5) are available to cover the entire R&D activity in the sector, as well as the clinical costs. That is why everyone is trying to shorten the time required for development. One element of this can be the application of open innovation, which supports collaborations and the outsourcing of activities instead of in-house forces. Because there is no time to internalize new skills within the company, there is no time to learn, the current R&D sub-tasks should be entrusted to an external unit that is already professional in the given field. This is definitely advantageous in terms of time, and may also be useful in terms of costs.

Of course, a conflict of different interests can be observed in this matter. The interest of the originator company (usually big pharma) is to maintain its monopoly as long as possible, which is exactly the opposite of the interest of the generic companies, which want to come to the market as soon as possible. Between the two interest groups are the consumers, the consumers of medicines, for whom some intermediate model would be most suitable. They benefit from the appearance of generic drugs in two ways: their appearance is accompanied by a price reduction, and at the same time, the original companies also have to develop new drugs, which will again protect them from generics. At the same time, a patent expiration that is too fast is no longer in the interest of consumers, since then it is no longer worth it for the originators to develop, or the testing of medicines will not be careful and long enough, which can be a potential source of danger from the point of view of patient safety.

How can pharmaceutical companies renew their innovation?

1. Separation of activities necessary for decision-making and implementation:
   - maximizing value creation through decision-making
   - limiting the internal implementation of labor- and/or capital-intensive tasks when the competitive advantages are only minimal
   - Example: planning clinical trials vs. clinical trial outsourcing (CRO)
2. Striving for operational excellence in all internal activities:
   - goal: to be first class in the industry and realize this in contracts
   - continuous comparison ensures operational excellence
   - example: during the production of chemical active ingredients, the experience gathered over a long period of time, slower innovation, significant capacities, established "professional workshops" and specialized manufacturers make/made resource allocation attractive
3. The activities carried out with the strategic long-term conclusions:
   - thanks to the ever-increasing power of suppliers, scarce capacities could lead to a redistribution of markets and profits (e.g. biological production of active ingredients)
   - Establishing rules, as already proven in computing, is the most powerful example: the pharmaceutical industry should work together and create standards as a basis for research and development, such as "Electronic Medical Records"
4. Possible franchise strategies:
   - typical examples are commercial activities, such as specialized sales, medical visitors, or key management for organizational customers
   - this regulation is also applied in R&D and especially in clinical developments
5. As we have seen, with organizational innovation, the creation of so-called PNOs - this is perhaps the most modern and the most effective way today. Of course, in order for this 5th point to be fulfilled, the organization must also successfully overcome the first 4 points and apply their results.

According to them, open innovation is nothing more than the exploration and exploitation of the ability to cooperate and co-create without being hindered by organizational restrictions with any possible cooperating party, in principle by mobilizing the entire globally distributed knowledge. The implementation of open innovation brings new "social technologies" to the fore. Its implementation is usually based on crowdsourcing or product development partnerships.

Open innovation is excellently illustrated by Chesbrough with the figure below:

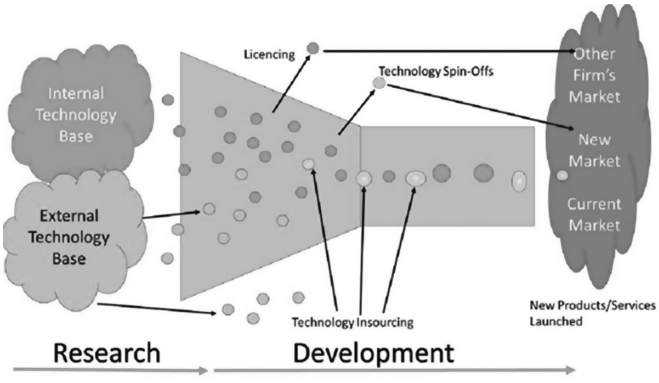

Figure 1: The open innovation model [22]

On the one hand, open innovation can be aimed at finding excellence that can be found beyond the boundaries of the company, but it can also be aimed at finding the "wisdom of the crowd". In this case, it is about the fact that the average knowledge of the crowd is closer to the exact solution of certain tasks under certain conditions than expert estimation. But the open call can simply be aimed at getting to know as best as possible what position the majority takes. To that extent, it is more of a marketing activity. Mass outsourcing

is now used for a wide variety of collaboration opportunities, including collaboration with consumers, suppliers, experts, and even competitors.

Perhaps most important is the open way of interactive value creation with consumers. There are extreme opinions about this. According to Von Hippel [23], the majority of innovative ideas already came from a specific group of users, the leading users, and by this he primarily meant people. That might be an exaggeration. Verganti's opinion is certainly very one-sided, as he radically denies the possibility of radically new product ideas for the consumer, even if there is an important truth in the fact that initially only those on the supply side can still know certain technological, organizational, legislative, marketing, etc. innovation opportunities.

Taking these into account, it can be seen that new types of risk reduction methods (collaborations, open innovation) can reduce the risk inherent in development costs over time. However, these steps have created new risks: in terms of knowledge sharing, IP, information flow and organizational innovation.

All in all, it can be concluded that the technological, risk reduction, and cooperation developments entailed the structural developments and the innovation of their development.

MATERIALS AND METHODS

Pharmaceutical value chain collaborations

Our research method is the literature, and after taking stock of our own experiences and industry trends, we conducted online interviews with experienced colleagues in the field.

Based on industry and confidentiality considerations, the interviews themselves cannot be published. However, they are definitely suitable for getting a comprehensive picture of the development of structures and opinions on collaborations, as well as mapping these trends and local/organizational specialties in this area.

So we conducted interviews based on a pre-prepared list of 43 questions. We grouped our questions into 9 main topics, and based on these, we conducted online discussions lasting 60-120 minutes per person. Although the authors focused on the topic areas, they tried to record the answers to all 43 questions.

When compiling the invitees, we also wanted to take into account interest in the industry, sectoral and capital supply, as well as academic/industrial spheres, as well as represent a kind of distribution in terms of company size. Based on these, our focus regarding the background of the interviewees was to conduct an interview:

- Hungarian/foreigner,
- big pharma/cdmo,
- small company/large company,
- academia/industry

with its representations.

RESULTS AND DISCUSSION

Project organizations

Investigating from project organisation point of view, the results of our research can be defined around 9 main points. These 9 points can be reviewed in Table 1.

Table 1: Decisive fields to manage

1	CDMO versus pharma: the goal is different, the innovation is different, the methods are different. It follows that the organization is different, its innovation and operational functioning are also different
2	One of the main risks: IP and secret protection. This changes the strategy, operation and structure as well.
3	A project pulls the organization along, the project generates its own organizational innovation
4	Capital-deficient environment: narrow immersion in professionals, projects, referrals to tenders: it works differently.
5	Small/undercapitalized organizations also understand the definitions of the basic terms differently: open innovation, hence the strategy and trajectory of innovation are of course different. The formation of a helix is unlikely.
6	Win-win situation: assigned partners: definitely at the project level: this requires organizational culture/learning.
7	Competence focus: there needs to be an area where the organization is the best, and it will be successful there.
8	For projects, a higher-level forum is needed, who represent the subordination (contract), but at more operational levels, the project is the goal (progress is important).
9	Product vs platform projects are different.

Source: Author's own construction

1. Biotechnological development and the management of innovations within it (technology, collaborations and structure) are the "playground" of large companies. This can be seen in the fact that, based on our interviews, a so-called The position of CDMO (Contract Manufacturing Organization) - which manufacture the medicine as part of contract manufacturing, but do not have their own product - and the big pharmaceutical companies (Big Pharma), because their goals are fundamentally different, and consequently the innovation and the methods used are different. Since CDMO only produces, it perceives the task as a "classic" project, Big Pharma considers the entire life cycle.

It follows that the organization is different, as is its innovation. Operative operation is also different from this. It is important that at the CDMO, the operative operation controls the innovation and the structure, at Big Pharma it is the other way around.

2. One of the main determining risks: industrial rights protection (IP), confidentiality and knowledge management. This also changes the strategy, operation and structure. Of course, every company reacts differently to this, but it can be said that the Western companies, which used to be on the biotechnology scene, start all kinds of collaborations armed with a very serious legal background. This is mostly unique, but it is influenced by:

- unique experiences,
- industry role
- vision / positioning
- the size of an existing, reliable partner circle.

3. In many cases, we see that the project "pulls" the organization along. This means that if there is a large/relevant project, the organization will generate its own organizational innovation from within (but for external motivation). This determines whether the organization is viable or not (in the sense of innovation). The primary experience is that the organization that can best achieve risk reduction is the one that can quickly and flexibly adapt to different project situations.

4. The innovation and perception of the organization in a capital-deficient environment is special. You have to live with the problem of narrow immersion (colleagues, resources, service providers) in specialists and projects. Referral to the tender is special (it is possible that it is a Hungarian specialty): all this gives the projects an additional "domestic" character. In addition to all of this, hierarchical relationships are typical, the totality of which can mean a negative spiral.

5. In the case of small/undercapitalized organizations, based on the answers to the question list, it can be established that in many cases the definitions of basic terms are understood differently than larger companies. For example, in the interpretation of "open innovation", it does not matter whether we mean a contractual partner/project partner/subcontractor, or only a partner outside the university or academic sector. Deduced from this, of course, the strategy and the trajectory of innovation are different. The achievement of the special helix structure is influenced by all of these. We will explain this helix model, the innovation of innovation, in our later writings.

6. Clear favoring of a win-win situation. Based on our responses from the Pharma company, it is important that the CDMO (Contract Development Manufacturing Origination, CRO (Contract Research Organisation), although they are subcontractors during the project, these units have a clearly assigned status during the project in practice they have, since a significant proportion of the capacities and specialized knowledge is focused in these organizations. That is, the project goal is the common one, if this is not successful, then the main goal (the goal of Big Pharma) will not be fulfilled either. All of this requires significant organizational culture/learning, which is consciously it is necessary to undertake and integrate it into the operation.

7. Competence focus: every actor needs an area where he is the best, what he knows best, and he will be successful there. Strategy, management and innovation must be adapted to this. It seems that Big Pharma companies are looking for industry excellence and will contract them. From this point of view, it is not a problem, and even an advantage, if our company has leading competences and references in even a narrower field, and does not represent the "everything available" model.

The strategic decision of this naturally depends on the characteristics of the market, competence, situation and industry.

8. If we focus on the internal operation of the projects, we found that a top-level forum is necessary, who represent the subordinate-superior order (contract), but at more operative, professional levels, the project goal (result-goal) is of paramount importance, should be the main line leader.

9. Product and platform projects are different: This can be considered a significant industry specialty, just as red, i.e. the value chain of pharmaceutical biotechnology, is also quite specialized. Product means that the given company will have a market product. This can mean an active ingredient or a finished product, i.e. a finished medicine. A platform project means that an assignment belonging to an element of the biotechnological value chain has been given, and it must be fulfilled accordingly. The assignment can be external (e.g. production of an active ingredient) or internal (e.g. process development). Both imply different organizations, structures and steps.

It can be concluded that our thesis is verified. (results 1-9). The challenges arising from the special innovation of red biotech also caused and necessitated the innovation of organizational structures and the development of its organizational operation (we called it: structure).

This can be seen in our model, in which we conducted interviews. We summarized our findings in 9 points. The findings we need to move forward are the following:

- In a large company: structure and operation are present as a kind of helix (strengtheningly), but also taking into account new elements of risk (IP)
- In the case of a capital-poor, small company or region (e.g. Hungary, or an academic background where appropriate), the attitude and thinking are also different, which brings with it a different methodology of innovation
- In addition to all this, flexibility, adaptability, and innovativeness are present and extremely important in thinking in the organization and in its innovation (1, 2, 3, 6, 8, 9)

CONCLUSION

Thesis: the challenges arising from the special innovation of red biotech also caused and necessitated the innovation of the development of the Structure and Operation of Organization (SO&OO). We have proven this, and we have identified further points that have yet to be researched below:

- In the case of a capital-poor, small company or region (e.g. Hungary) or academic background, the attitude and thinking are different, which brings with it a different methodology of innovation
- A special helix model can be developed, which more clearly supports the specialties of red biotech innovations

Recommendation:
Our article is recommended by our mutual friend, mentor, colleague, in honour of dr. Kálmán Könczöl (1954-2023).

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THE NEXUS BETWEEN SUSTAINABLE VALUE CHAIN ACTIVITIES AND FINANCIAL BENEFITS OF THE SOYBEAN VALUE CHAIN SYSTEM IN THE NORTHERN REGIONS OF GHANA

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Abstract: *Soybean is an important crop that contributes to economic freedom and food security. The study of soybean value chain is therefore important to improve on the activities of the chain actors for an overall economic gains. This paper aims to examine the nexus between sustainable value chain and financial benefits of the soybean value chain system in Ghana. Specifically, we employ the triple bottom line model to examine the soybean value chain from economic, social and environmental perspectives using sample data from Ghana. With a sample size of 300 including all actors of the value chain, our findings reveal that chain actors do not differ in their perceptions of overall financial gains that accrued to them with their involvement in chain economic activities. The findings further revealed that perceived financial sustainability of chain activities was affected by tangible financial benefits. Moreover, the results further show that chain actors' perception of social sustainability performance was significantly affected by expected overall financial gains that accrue to them as a result of their participation in chain economic activities.*

Keywords: *sustainable value chain, financial benefits, economic activities, social sustainability, financial sustainability*

INTRODUCTION

Over the years, the value chain concept has proven useful for the identification and formulation of projects as well as in the development of strategies for improved agricultural enterprise development (Vermeulen et al. 2008). A value chain as introduced by porter (1985) is a full range of activities required to bring a product or service from conception through the different phases of production, transformation and delivery to final consumer and to final disposal after use (Zamora 2016; Kuwornu, Abdulai & Osei-Asare, 2013). The chain consists of a series of actors (or stakeholders) – from input suppliers, producers and processors, exporters and buyers-engaged in the activities required to bring a product from its conception to its end use (Kaplinsky and Morris, 2001). In many parts of the world, the emerging retail revolution is reshaping the way agricultural commodities are produced, procured and sold. Rapid changes in dynamic modern markets affects the entire value chain-input suppliers, producers, processors, wholesalers, retailers and consumers – with immense impact on competitiveness and future viability of small-scale agricultural producers (Vermeulen et al, 2008).

The authors again observe that with modern markets replacing traditional market forms, outlets for small-scale producers are reducing quickly. Coming along with these changes is the risk of increasing poverty, not just for those producers but for entire rural communities. But they also note that, with the right support, small-scale producers can be efficient and reliable providers of quality produce. Such a production system requires a sustainable value chain system. The sustainable value chain system balances three key pillars-economic goals, societal goals and environmental goals, often referred to as the triple bottom line model (Mann and Kaur 2019). Since the triple bottom line model was introduced, it has been applied in several empirical value chain studies (Fearne 2009; Fearne & Dent 2012), but scarcely applied in the Ghanaian context. In the Ghanaian context only the study of Mensah-Bonsu et al. (2019) was identified but even that study was on poultry. There is no application of the triple bottom line model to soybean value chain analysis in Ghana in spite of its capabilities

to balance off economic, social and environmental goals. This study is therefore the first to apply the model to examine the soybean value chain system in Ghana. The study further explores the relationship between sustainable value chain activities and financial benefits of the soybean value chain system.

The soybean value chain system is considered because according to Goldbitz (2009), soybeans have become the world's leading food and feed crop, providing more protein and vegetable oil than any other single commodity. He concludes 'the world has come to rely upon this efficient resource to feed both livestock and people directly.' It is within the context of this phenomenon that soybean cultivation in the northern part of Ghana is fast becoming a viable source of cash income, as soybean is increasingly being processed into a number of valuable products used in the fast food, snack, and convenience food and poultry industries in Ghana. The increased demand for processed soybean products has also been spurred on by growing middle class who are becoming increasingly aware of the importance of eating healthy food, for which soybean products are good sources of such foods.

The rural-based economies are being structurally transformed with more urbanized societies and this is opening new market opportunities so that it creates space for poor resourced producers to participate in national economic activities via the value chain approach (Vermeulen et al., 2008). This requires establishing an official value chain system; however, this can only be achieved according to Prakash (2010) if the value chain is designed to overcome the following critical challenges; market integration, production innovation, farmer-based organizations and institutional support. It was to address these constraints in the industry that led to the introduction of value chain project in the four northern regions in the country. This study therefore uses the triple bottom line model to examine the value chain projects and propose policy recommendations to policy makers to improving the soybean value chain system in the Northern regions of Ghana.

LITERATURE REVIEW

Structure and Dynamics of Value Chain System

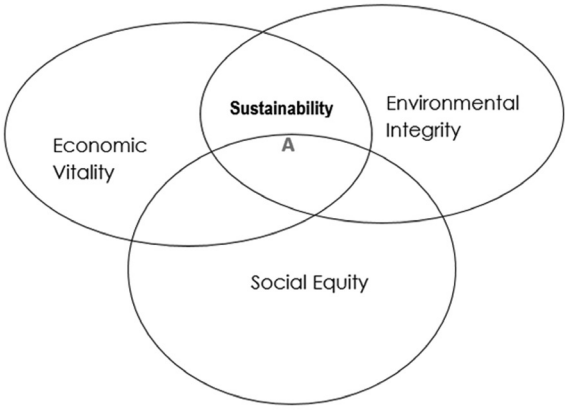
Insights gained from the definitions and the basic elements of value chain, suggest that value chain concept refers to all the activities and services that bring a product (or a service) from conception to end use in a particular industry –from input supply to production, processing, wholesale and finally, retail (Kaplinsky and Morris 2001). The term is appropriate because value is being added to the product or service at each step of the chain. Thus, knowledge of the structure of value chain is very important, since the structure influences the dynamics of participation and these dynamics in turn influence how well the value chain performs in terms of value chain competiveness, distributional benefits along the chain and addressing the major constraints and opportunities faced by business of multiple levels of the value chain.

Chain sustainability

Chain sustainability activities are increasingly becoming important issues in value chain design and management. In respect of this, the concept of chain sustainability focuses on management practices and design efforts on the search for ways to improve economic performance while reversing the retardation of environmental resources and making the distribution of economic and environmental outcomes more equitable among chain actors. For example, socio-economic system often become caught up in adversarial economy versus environment debate and begins to operate in a linear direction, that is taking resources from natural resource system, making them into products and throwing them away to produce large amount of waste (Flint, 2004). This process can lead to an entire system being unsustainable.

The review of the literature on sustainable development suggests that chain organizational sustainability, at a broader level consists of three components: the natural environment, society and economic performance as shown in the diagram below. Figure 1 presents a visual representation of these three components and corresponds to the idea of the triple bottom-line, a concept developed by Elkington (2004), which simultaneously considers and balances economic, environmental and social goals from a micro-economic standpoint. Within this context, Carter and Rogers (2008) contend that organization recognize that sustainability is not simply a matter of good corporate citizenship earning points for engaging in sustainable practices such as providing health care benefits to employees but now a fundamental principle of smart management (Savitz and Weber 2007). Thus the triple-bottom line model suggests that at the intersect of social, environmental and economic performance, there are activities that organizations can engage in which not only positively affect the natural environment and society, but which also results in long-term economic benefits and competitive advantage for the firm.

Figure 1: The Triple bottom line sustainability model



(Carter and Rogers 2008)

The conceptual model of sustainability above illustrates the relationship among economic, environmental and social issues of concern in decision making. The area marked A the overlay of the three circles represents the nexus of connection among issues. Hence when considered in relation with value chain activities, the model suggest, there are social and environmental values chain activities that lie at the intersection with economic bottom line – these are the activities that are defined as sustainable (Carter and Rogers, 2008 and Flint 2004), potential financial gain as a result of financial with social and or environmental performance. These include: 1) Cost saving due to reduced packaging waste (Shrivastava

1995c; Mollenkopf et al.,2005) and the ability to design for reuse and disassembly (Christmann, 2000), 2) Reduced health and safety costs, and lower recruitment and labour turnover cost resulting from safer warehousing and transportation and better working conditions (Carter et al., 2007), 3) Lower labour cost – better working conditions can increase motivation and productivity, and reduce the absenteeism of supply chain personnel (Holmes et al., 2013), 4) Proactively shaping future regulation-companies that proactively address environmental and social concern can influence government regulation when this regulation is modeled after a company's existing production and supply chain processes, leading to a difficult – to – replicate competitive advantage for companies and their suppliers (Carter and Dresner, 2001), 5) Reduced cost, shorter lead time, and better product quality associated with the implementation of international standards, which provide a framework for environmental management,6) Enhanced reputation – engaging in sustainable behaviour can make an organization more attractive to suppliers and customers to potential employees (Capaldi, 2014) and to shareholders.

According to Carter and Rogers, (2008), while most of the above outcomes are "good" examples of ways in which a firm can improve its sustainability, true sustainability occurs at the intersection of all three areas – environmental, social and economic – and includes multiple activities (example of activities in the aggregates, where an organization explicitly and comprehensively incorporate social, environmental and economic goals in developing strategic vision and long-term strategic objectives. In their review of supply chain management literature they indicated that the environmental and social aspects of sustainability can extend beyond an organization's boundary to include supply chain activities. When coupled with economic objective to develop a clear, long-term strategy, the inclusion of supply management activities in a firm's sustainability can actually create a longer-lasting and less imitable set of processes. Thus, firms which attempt to simultaneously maximize performance of all three dimensions of the triple bottom-line will outperform organizations that attempt to only maximize economic performance or companies that attempt to achieve high level of social and environmental performance without explicit consideration of economic performance (Flint, 2004 and Carter and Rogers, 2008).

METHODS

Data

The data for the study was collected from the four northern regions of Ghana using purposive sampling technique. Three of the regions (Northern region, upper East and upper West regions) fall in the Guinea Savannah agro ecological zone. The guinea savanna zone is one of the hottest and driest agro-ecological zones in the country with the mean annual day temperature hovering around 40OC or more. The mean annual rainfall is about 1000mm with a unimodal rainfall distribution from May to September that supports only one cropping season in a year (Buckle, 1996). Major crops that thrive well here include millet, sorghum, soybean, cowpea, peanut, yam and cotton. Most crop production activities in the agro-ecological zone are done under small-scale production system and rain-fed conditions. The regions were selected based on initial review of document of soybean production and value chain activities in the regions of Ghana. The selected regions include: Northern, Upper East, Upper West and Brong-Ahafo regions. Three of the regions host key components of the commercial soybean value chain in Ghana: the Northern and Upper East and Upper West regions have highest concentration of soybean producers in the country, and the fourth region, Brong Ahafo is the location for the major soybean processing factory in the country in addition to a number of small- scale soybean processing facilities. Available socio-economic data suggest that 80% of the population in these regions depend on subsistence agriculture (Ghana's MoFA: Facts& Figures 2009, 2011) for their livelihood, and this study was designed to ascertain how this type of production system has been well integrated into the value chain system to improve the market for raw soybean.

Purposive, stratified, random and snow balling sampling techniques were employed to obtain appropriate sample size from which to gather relevant data for the study. The population for the study was made up of the total number of the various stakeholder types who have been registered with the soybean value chain project in the in the northern part of Ghana. The various chain actors contracted under the scheme were stratified into the following subgroups: (1) small-scale soybean producer cultivating less than five hectares of farm land and does not belong to any farmer organization {i.e. independent small-scale producers (ISSP)} (2) small-scale soybean producers cultivating less than five hectares of farm land and a member of a farmer organization {ie group-based small scale producers(GSSP)} (3) large-scale soybean producers cultivating over five hectares farm land and do not belong to farmer-based organization {i.e. independent large-scale producers(ILSP)} (4) large-scale soybean producer cultivating over five hectares of land and a member of a farmer-based organization {ie group-based large-scale producer (GLSP)}.

Project report obtained from the facilitating organizations identified 3,000 soybean producers currently registered with soybean value chain project. After a series of consultation with project managers and a review of the report, the stratified sampling technique was adopted to stratify the entire population of 3,000 registered farmers associated with the project into the following categories of soybean producers and their proportions within the total population as follows: (1. Independent Sample-scale Producers (1,000), (2. Group based small-scale producers (1,000), (3. independent large-scale producers (600), and (4. Group-based large-scale producers (400). 10 percent of producers were randomly selected from the populations of each producer category to obtain a sample size of 300 respondents.

However, major weaknesses of this technique is that there is the need for accurate information on proportion of population in each stratum since this could lead to an increase in error, and also an increase possibility of faulty classification in the absence of stratification. The weaknesses were how-

ever dealt with in this particular study with a careful review of project documents obtained from facilitating organizations to provide the basis for the stratification.

The population of the other stakeholders apart from the producers are scattered over the communities in the study area and it is not easy to find them in the communities where they are supposed to be located. For these reasons the snowball sampling technique was the appropriate sampling procedure used to obtain the sample size of each stakeholder type. Some key informants who themselves were qualified to be included in the sample were identified and then interviewed with the appropriate research instrument. These persons in turn led to more persons who were also interviewed. The process continued till an appropriate sample size of each stakeholder type was obtained. Thus, the following sample sizes were obtained for each of stakeholder type identified. Input suppliers =22, producers=223, buyers (e.g. aggregators and processors) =9, and service providers (e.g. financial, tractor and haulage services) = 46. Snowball or chain referral sampling was particularly useful in this study because of the wide geographical spread of the identified key stakeholders.

The primary data used for this study were obtained from selected representatives of key actors and stakeholders associated with soybean value chain project. Questionnaire, interview schedule and focus group discussion were the three main instruments used to generate the primary data collected over a period of four (4) months (January- April 2012). The questionnaire was designed to generate the primary data to address the objectives of the study. The questions were designed to elicit data from all stakeholder types on the following items: chain economic activity, input requirement to role play effectively, gains from the participation in chain economic activity, Challenges encountered in the performance of role in the chain system, specific functional role in the chain system. The questionnaire was pre-tested with similar value chain actors and stakeholders in a different commodity value chain system in the same study area. Participants were asked to comment on the format of the questionnaire including specific aspects such as wording, length and the order of the questions. The feed-back obtained after this exercise was incorporated to improve the quality of the questionnaire.

Twenty-five experienced enumerators were recruited from extension agents in the offices of Ministry of Food and Agriculture (MoFA), Ghana in the study area. The enumerators were given a day's training on how to administer the questionnaire. On the field, each questionnaire was administered for an average duration of one and half hours. To increase the response rate, each enumerator stayed with each respondent for as long as it took to complete a questionnaire.

Interview schedule was the last of the data collecting instruments that was designed to gather the primary data for analysis in this study. The interviews were largely open-ended; using interview guides which specified broad themes to be covered and key issues to be explored. The interview schedule was designed to cover broad areas of interest like the kind of product/ service provided by an actor in the chain, the number of years the actor had provided the service/ product, sources of input, problems associated with the sources of inputs, suggestions to solve problems and energy used and its impact on the environment.

In all eight, (8) interviews were conducted each lasting three hours with the following actors in the chain: nucleus farmers or their representatives , large-scale farmers, small-scale farmers, tractor service providers, seed growers, input suppliers, credit officers, processors, representatives of senior management of facilitating organizations and value chain management committee members. Some of these participants were purposefully selected while the ones representing organizations/firms were nominated by the heads of their organization/firm. The interviews were conducted to observe as well as to have insights and validate some of the key issues that were raised during the focus group discussion session and respondent survey. The interviews were held either in organization's premises, if participants were from organizations and farming communities if the participants were farmers. However, with all other participants it was in office locations that were agreed upon for that purpose. Some interview sessions were captured on tapes with permission of participants while others were captured as written records. All interviews were conducted between March and April 2012.

In this study chain sustainability is delineated as a construct that has three dimensions – that is, environmental, financial (note that financial is the same as economic in this study and social in an attempt to determine stakeholders' perception of the soybean value chain system performance on the sustainability of chain activities in relation to the tangible and intangible economic benefits that accrue to economic actors of the chain. Hence, this study operationalized all three dimensions of the chain sustainability construct by formulating composite statements which captured the range of commercial benefits discussed on a ten point likert scale- Scale: 1=extremely poor, 2=moderately poor, 3=slightly poor, 4=poor, 5=average, 6= slightly good, 7=moderately good, 8=good, 9=very good, 10=excellent. A weighted average of the ten-point likert scale was used to assess the actors perception of the chain activities across the sustainability constructs.

RESULTS

The Perception of key stakeholders' sustainability indicators

We present stakeholders perception of key value chain activities relative to environmental, social and economic sustainability in Table 1. The results have been discussed according to actors starting from input suppliers, producers, aggregators, logistic service providers, financial service providers and chain facilitators.

Input suppliers

There was a high degree of consensus among input suppliers within the chain that environmental sustainability within the chain was generally moderately good (7.3) as far as their business operations are concerned (Table 1). They attributed this to the fact that: First, they are very much aware of the negative impact on the environment of some of their business activities. For example, fertilizer and agro-chemical suppliers were of the

opinion that improper disposal of agro-chemical containers/ packaging material with chemical residue are environmentally hazardous, and admitted that there have been reported cases of chemical poisoning of humans, and animals as a result of this practice. Secondly, discussants observed that through training workshops and seminars organized by accredited agents of major agro-chemicals companies such as Wienco and Dizenghof from time to time do equip them with skills on proper handling and disposal of fertilizer and agro-chemicals supplied by these companies. In addition, chain facilitators' environmental specialists regularly provide up-to-date information on sound environmental and best practices in their business operations that help them to minimize negative impact of their business operations on the environment from time to time.

With regards to financial sustainability, performance was also deemed to be moderately good among this group during the interview (Table 1). There was consensus on the fact that incomes have generally improved with this group, since their involvement in the chain. This has therefore led to significant improvement on their ability to save as well as contribute to community development projects.

Social sustainability performance was also generally considered slightly good according to Table 1. The group attributed this to the social network system which has evolved over the years, and which has been further strengthened by the advent of mFarm ICT Platform that links actors and facilitate the exchange of technical, business and market information to enhance information flow within the group and along the entire chain. A value chain development and management committee formed with representatives of major actors in the upstream segment of the chain has been vested with the responsibility to ensure accountability and equity in the distribution of chain benefits upstream and this also appears to explain their slightly good perceptions of social sustainability performance in the chain.

Producers

Discussants representing all categories of producers in the chain were unanimous in their verdict on moderately good performance of environmental indicators as far as the farm business activities are concerned (Table 1). In relation to financial and social sustainability, discussant rated moderately good and slightly good, respectively for the farm business activities concerned. Discussants agreed that their participation in environmental sustainable activities/practices by chain facilitators has (i) created awareness among their ranks of farm production activities that are environmentally damaging. Examples cited include, indiscriminate application of agro-chemical to control pests, diseases and weeds, uncontrolled bush burning and many such environmentally damaging activities (2) built their capacity to deal with negative environmental outcomes of farm production practices if they occur, for example, training on the control of uncontrolled fire outbreaks on farm and training on proper application of fertilizers and other agro-chemicals, as well as the use of organic fertilizer instead of inorganic fertilizer. Environmental specialists with chain facilitators have instituted a programme that update farmers regularly on sound environmental practices throughout the year for farmers and this has also been cited by participants as one of the key factors that underscores the rating of environmental sustainability among producers (Table 1).

The implementation of government's policy on producer price for soybean at the beginning of the planting season ap-

Table 1: Discussants' indicator assessment score for chain sustainability construct

Specific chain	Indicator	Input suppliers	Soybean producers	Buyers/ aggregators	Processors	Logistic service providers	Financial services providers	Chain facilitators
Environmental								
i	Awareness of environmental hazards	7.2	7.0	3.0	4.8	4.9	4.0	5.6
ii	Sensitization to sound environmental practices	7.1	7.5	4.0	4.6	5.0	4.7	6.2
iii	Capacity to deal with environmental hazards	7.5	7.2	3.2	4.4	5.1	5.4	5.0
	Total	7.3	7.2	3.4	4.6	5.0	4.7	5.6
Financial								
i	Satisfied with income earnings capacity	6.9	6.7	2.2	5.0	5.0	4.7	6.2
ii	Ability to save income	7.7	7.3	5.0	4.2	5.0	4.7	7.0
iii	Ability to reduce indebtedness	7.6	6.5	5.5	4.8	5.0	4.8	6.5
	Total	7.4	6.8	4.2	4.7	5.0	4.7	6.6

Social								
i	Satisfied with equitable distribution of benefits	6.4	5.6	6.6	4.8	6.8	4.9	5.6
ii	Satisfied with value chain ability to provide social network system that supports weaker members	6.0	7.0	5.0	6.7	6.0	5.6	5.8
iii	Improved ability to contribute community development project	6.2	6.5	6.2	6.6	6.5	5.7	6.0
Total		6.2	6.4	5.9	6.0	6.4	5.4	5.8
Total average score		6.9	6.8	4.5	5.1	5.4	4.9	5.9

Scale: 1=extremely poor, 2=moderately poor, 3=slightly poor, 4=poor, 5=average, 6= slightly good, 7=moderately good, 8=good, 9=very good, 10=excellent

pears to have significantly improved farmers' income within the chain and thus improved farmers' ability to save, hence a key underlying factor for financial sustainability in the chain. Participants were also keen to point out that their involvement with the value chain's economic activities has also improved their capacity to contribute financially to development activities in their communities as well as chain improvement activities.

Social sustainability performance was also considered as being slightly good as shown in Table 1 and they attributed this to the opportunities created by the pre- and post-season events, and the existence of farmer-based organizations, the nucleus farming concept and the formation of the value chain development and management committee all of which play significant roles to ensuring accountability and adherence of chain members to the rules and regulations set out to control chain activities for the benefit of chain members upstream.

From Table 1, it could be seen that sustainability performance among producers is generally moderately good. However, there was the need to reduce fossil-fuel-based mechanized operations in farm production operations that tend to increase carbon emission load that is normally associated with upstream activities and creates biodiversity instability brought on by expanding farm production activities upstream. When these issues are properly dealt with by chain managers then sustainability could be further improved along the chain to the benefit of all.

Aggregators

The results presented in Table 1 highlights the responses of aggregators when they were asked to evaluate their perceived performance of all the aspects of chain sustainability – environmental, financial and social. The results indicated that performance of chain environmental sustainability was ranked slightly poor 3.4 (Table 1) to underscore the claim that they are not aware that any of their business operations has detrimental effect on the environment and have therefore, not received any training within the chain to handle such threats from their business operations. The aggregators also ranked the performance of chain financial sustainability poor, asserting that government-backed producer price of Gh¢70.0 per 100kg bag of raw soybean has significantly eroded their profit margins, and therefore impaired their ability to save and invest in chain improvement activities. Discussants agreed that the policy should be reviewed and if possible prices should be determined by supply and demand conditions on the market.

Aggregators' evaluation of chain social sustainability performance was ranked slightly good (Table 1). This they attributed to their inability to organize themselves into an association/business group as chain members, thus denying them of a key social infrastructural system that could have enhanced social networking among them to improve their perception of chain social sustainability performance. The situation is also not helped by the attitude of chain facilitators in the sense that, it appears to be a deliberate policy to discourage aggregators from organizing themselves into a business association or group. Chain managers believe that if they are allowed to do so they could constitute themselves into a very powerful buying cartel, a phenomenon that might undermine competitive pricing in the chain.

Processors

Table 1 provides a summary of the results of small-scale processors assessment of their perceived performance of all three components of overall chain sustainability. Discussants unanimously agreed that their participation in the value chain has made them aware of certain aspects of their business operation that are potentially damaging to the environment. They cited examples like discharge of hot affluent and pollutants into surrounding water bodies/ streams close to areas where their plants are cited, the use of fossil-based-fuel in some mechanized operations as well as the accumulation of foul-smelling sludge discharged as waste from the oil extraction process.

However, they were quick to add that they are given regular training on how to handle some of these environmental challenges through workshops and seminar organized by Ghana

Environmental Protection Agency from time to time. In an interview with a senior manager of the Ghana Nuts Limited, a leading agro-processing factory in Techiman which is involved with the soybean value chain project revealed that the factory has set up an ultra-modern waste treatment plant that handles all waste generated during processing on their premises.

On financial sustainability, discussants adjudged the perceived performance on all indicators as average (Table 1). However, they lamented about the recently introduced produced price of GH¢70.00 per 100kg bag of raw soybeans; and suggested that the price should be reviewed downwards for the price of Ghana's soybean to be competitive with the price of imported soybeans. Indicators specified to determine social sustainability performances within the chain were assessed as slightly good (Table 4) by the discussants and insisted that in-built social infrastructures (i.e. the pre- and post-season events and mFarm ICT Platform as well as the formation of business association) within the chain have assisted chain efforts at value integration of all economic actors to ensure chain accountability as well as equity in the distribution of economic gains along the chain.

Logistic service providers

Most logistic services are provided by tractor operators, hence they were the ones who represented this group in the focus group discussion and their views expressed during the discussion were supplemented with the views of transport operators who were interviewed during the studies. The summary of the result of the discussion is presented in Table 1. The results indicate that their assessment of all the aspects of sustainability on the scale of performance was generally average, implying that they were adequately equipped to recognize the negative effect of their business operations on the environments. When discussants were asked to give examples of such activities, they noted in particular the use of fossil fuel in most of their operations including ploughing and harrowing of farm lands as part of land preparation for sowing that are key business operations, and that they have detrimental effect on the environment. However, they also noted that chain environmental specialists from the chain facilitating organizations are providing regular training to help them minimize these threats.

On financial sustainability, the consensus was that business is generally average since their involvement in the value soybean value chain. They however, expressed concern over the inability of some producers to honour "gentleman' agreement to pay in-kind for services rendered to them at the end of each harvest season. This appears to create tension in their relationship with producers at the end of every harvest season. They also expressed disquiet over the rising cost of fuel and auto parts, and this they indicated was eroding economic gains in the chain.

Social sustainability according to the discussants was well grounded in the chain activities as far as they are concerned, because most of them are either farmers, aggregators or both, providing the basis for a working relationship that enhances social sustainability. Moreover, they concluded that the advent of mFarm ICT Platform and pre-season and post-season events and other social activities organized by chain managers with active cooperation of all chain actors was providing avenues for both formal and informal interactions to enhance social networking.

Financial service providers

Financial service providers are not directly involved with product flow within the value chain; hence their linkages with clients within the chain are mainly transactional. Thus, looking on from the outside, they assessed all aspects of sustainability on the performance scale as generally average and believed that there is still scope for improvement.

Chain facilitator

As key component of their strategy, chain facilitators are keen to ensure that there is significant improvement on its performance scale of all dimensions of chain sustainability-environment, financial and social. Thus, their evaluation of sustainability performance within the chain is generally slightly good but quickly added that there is still more scope for improvement (Table 1).

Perception of Key Stakeholders on various chain activity performance scale

This section presents the results of the survey, which was mainly focused on the quantification of the benefits that key stakeholders attach to the chain activity of all three dimensions of the chain sustainability construct when evaluating the tangible and intangible financial benefits that accrue to them as they participate in the economic activities of the soybean value chain system. The results provide hints as to what motivates stakeholders' continuous participation in the value chain, and insights as to how the phenomenon can be harnessed to develop a sustainable and viable value chain system that creates space for the various actors to engage in meaningful economic activities.

Results of factors influencing tangible and intangible financial benefits across stakeholder types

All constructs of chain activity performance scale were conceptualized as two-factor constructs: the first factor was referred to as tangible financial benefits and the second factor as intangible financial benefits. The term tangible and intangible have been applied to describe the perceived financial benefits that accrue to the various actors in the soybean value chain in Ghana. Tangible financial benefits is so referred to because the items that were loaded contain statements that describe gains that can clearly be seen to exist and intangible financial benefits had items loaded to describe gains that do not exist as physical assets but still valuable to the chain actor.

On the three aspects of chain sustainability – environmental, financial and social sustainability – the factor loadings in respect of the tangible and in tangible financial benefits con-

structs are presented in Tables 2-4. For environmental sustainability, the first factor, tangible economic factor has four items loaded onto it and these are: reduction in total business expenditure, safeguard unique product characteristics, improved value of business assets, satisfied with price received for product sold. However, with alpha value of 0.54 which was less than 0.6 the conventional cut off point, it implied that the statements used did not significantly contribute to the variance of the tangible financial benefit factor (Table 2). Thus these statement items were not used for any further analysis.

Table 2: Factor analysis for financial benefit of environmental sustainability performance across stakeholder types

Factor and Items	**Factor loading**
Financial benefit of environmental sustainability performance KMO	
Tangible Economic Benefit of Environmental Sustainability Performance	
Explained variance = 42.82% KMO = 0.725 Cronbach Alpha = 0.544	
Ability to reduce total business expenditure of my farm business operations	0.733
Capacity to safeguard the unique compositional characteristics of my farm produce	0.789
Improving my specific business asset value within the chain	0.662
Receiving premium product prices for my produce from my buyers	0.646
Improving my returns on investment in business assets in the chain*	
Intangible Economic Benefit of Environmental Sustainability Performance	
Explained variance = 50.83% KMO = 0.742 Cronbach Alpha = 0.755	
Improved capacity to comply with national and international environmental regulatory requirement	0.698
Ability to protect my market share gained through my participation in this chain	0.743
Sharing the risk and rewards with other chain partners	0.609
Strengthening business relationship with other chain actors in this chain	0.775
Ensuring that my business cooperates with other chain partners to solve environmental problems when they arise	0.729

**Item suppressed in exploratory factor analysis for less than 0.5 factor loading*

The second factor loaded five items: improved capacity to comply with national and international regulatory requirement; ability to protect competitive advantage through participation in chain environmental training, shared risks and rewards gained through sound environmental practices, collaborating with chain partners to solve environmental problem when they arise, and strengthen collaboration and cooperation with environmental regulatory bodies such as Ghana Environmental Protection Agency (GEPA). With an alpha coefficient of 0.755 which was higher than 0.6 the conventional cut off point and explained variance of 51% (Table 2), there was an indication that the underlying construct of this factor was adequately reflected by these statements.

The social sustainability dimension, tangible financial benefit factor had four items loaded onto it (Table 3) with associated alpha value of 0.787 and explained variance of 61%. It meant that the factor measurement scales used, explained adequately the underlying construct. For the intangible financial benefit factor the alpha coefficient was 0.795 and the explained variance is 62%, thus suggesting that the statements specified under this factor adequately explained the underlying construct.

Table 3: Factor analysis for financial benefit of social sustainability performance across

Factor and Items	**Factor loading**
Financial benefit of Social Sustainability	
Tangible financial benefit of social sustainability	
Explained variance = 61.07% KMO = 0.783 Cronbach Alpha = 0.787	
Earning satisfactory business profit to enhance continued association with other chain actors to achieve shared business goals for the value chain.	0.810
Increase financial returns on investment in business assets to improve value chain activities	0.773
Improve business' financial capacity to support community development	0.757
Reduce transactional cost in business activities to enhance collaboration among chain actors.	0.784
Intangible financial benefit of social sustainability	
Explained variance = 61.97% KMO = 0.772 Cronbach Alpha = 0.795	
The development of social network system within this chain supports the most	0.800
Development of social capital assets/infrastructure in the value chain system to Development system of rewards and sanctions regimes to ensure distributional equity for all actors within the chain	0.823
Evolution of chain regulatory structures ensures accountability of all chain participants	

**Item suppressed in exploratory factor analysis for less than 0.5 factor loading*

Finally financial sustainability dimension had in the first and second factors loaded with three items each on the factor measurement scale. For the first factor it includes: my business is generating enough revenue in chain economic activities, profits earned by my business are satisfactory to enable me invest part in chain development activities, my business has improved its financial capacity to reduce its indebtedness to creditors.

For the second factor they are: general satisfaction with financial gains since participation in value chain activities, perceived improved credit worthiness with financial institutions my business deals with, and an improved financial position

has enabled my business to institute equitable incentive distribution system for the benefit of my workers. The respective alpha values were 0.643 for the first factor, (tangible financial benefit) and 0.698 for the second factor (intangible financial benefits). Since they were all above the conventional cut off point of 0.6 (Table 4), it suggested that the measurement scales are deemed to be good measure of the underlying constructs of the two factors. In an attempt to compare chain activity performance scales across stakeholder types, the retained items from the factor analysis were subjected to one-way analysis of variance (ANOVA). Specifically, the ANOVA was used to analyze the impact of variance of each chain activity performance factor independently (Table A-Table C in Appendix).

Table 4: Factor analysis for financial benefit of financial sustainability performance across stakeholder types

Factor and Items	**Factor loading**
Financial benefit of financial sustainability performance	
Tangible financial benefit of financial sustainability performance	
Explained variance = 62.09% KMO = 0.658 Cronbach Alpha = 0.643	
My/our business is generating enough revenue from my/our business activities to be able to continue to engage in the economic chain activities.	0.826
Business participation in the value chain activities has enabled me /us to generate satisfactory profit to invest in chain activities that benefit all chain actors	0.757
Business improve its financial capacity to reduce its indebtedness to creditors	0.779
Intangible financial benefit of financial sustainability performance	
Explained variance = 62.38% KMO = 0.665 Cronbach Alpha = 0.698	
Business is generally satisfied with financial gains made as result of participation in the value chain activities.	0.753
Perception of my/our business' credit worthiness has generally improved with financial institutions.	0.810
Improved financial position in the chain has enabled me/us to institute incentive distributional equity system for the benefit of all	0.806

**Item suppressed in exploratory factor analysis for less than 0.5 factor loading*

Analysis of Variance of Financial Benefit of Sustainability Performance Construct Across Stakeholder Types

The results of the financial benefits of environmental sustainability dimensions of chain sustainability performance in Table A in Appendix indicates that there were no significant differences in the overall tangible and intangible financial benefits as far as these dimensions of chain sustainability were concerned, implying that chain actors do not differ in their perceptions of overall financial gains that accrued to them with their involvement in chain economic activities. Consequently, their perceptions of environmental sustainability of chain activities were not influenced by expected financial gains that may likely accrue to them.

The impact of overall financial benefits of perceived financial sustainability is shown in Table B in Appendix. The results revealed that there was significant difference in the overall tangible financial benefit across all stakeholder types at 10% level of probability while intangible financial benefits across stakeholder types in the chain was not statistically significant. These results suggested that perceived financial sustainability of chain activities was influenced to some extent by expected tangible financial benefits that may accrue to members. Meanwhile, the overall intangible financial benefit did not elicit such influence among the stakeholders in the chain.

Table C in Appendix shows the results of the influence of perceived tangible and intangible financial benefits of social sustainability chain activity as accrued to chain members. The results reported significant differences at ($p<0.05$) level in overall tangible and intangible financial benefits that accrued to chain members. This result implied that stakeholders' perception of social sustainability performance was significantly affected by expected overall financial gains that accrue to them as a result of their participation in chain economic activities.

CONCLUSION

The results of the value-chain analysis concluded that sustainability performance assessment among the various chain actors was deemed to be generally good on all the three dimensions of the chain sustainability construct. On the basis of the results of principal component analysis it can be concluded that on the three dimensions of the sustainability construct-environmental, social and financial- chain actors were satisfied with both tangible and intangible financial benefits that accrue to them with their participation in the soybean value chain since the statements that explained these two factors were all associated with alpha value of at least 0.6 of the conventional cut-off point suggesting that the measurement scales are deemed to be good measure of the underlying constructs of these two factors (i.e. tangible and intangible financial benefits).

The analysis of variance (ANOVA) result reveals that perceptions of environmental sustainability of chain activities were not influenced by expected financial gains that may likely accrue to them. However, the perception of social sustainability performance was significantly affected by expected overall financial gains that accrue to them as a result of their participation. Meanwhile, these results suggested that perceived financial sustainability of chain activities was influenced to some extent by expected tangible financial benefits that may accrue to members but the overall intangible financial benefit did not elicit such influence among the stakeholders in the chain.

Based on the findings of the study, the following recommendations are made: 1) That for the sustainability of environmental activities, there should be public-private partnerships efforts to establish a waste treatment plant to process the excessive waste generated along the chain into other useful products such as hog feed and organic fertilizer, increase the number and improve the quality of training sessions that sen-

sitize chain actors on the impact of their operations on the environment and environmentally sound business practices that reduce negative effect of such operations on the environment. Furthermore, the training should equip the participants with skills to deal with negative effects of their business operations on the environment when they do occur, 2) That social sustainability could be improved when chain stakeholders work together to evolve chain social infrastructural system that ensure accountability, equitable reward system that favours those who contribute time, efforts and resources to chain development as well a sanction regimes that ensure compliance to chain rules and regulations. Furthermore, chain facilitators should assist with the setting up of social development fund with contributions from all actors of the chain to provide social amenities like health clinics, schools, markets, as well as social centers in areas with high concentration of soybean producers to stem the migration of would-be young farmers from these area to adjacent urban centres, 3) That for financial sustainability of chain economic activities, the efforts of chain facilitators should be directed towards the evolution of financial reward system that is seen to be equitable and transparent, to disabuse the minds of the poor-resourced members of the chain to the effect that the well-endowed members downstream are taking advantage of their vulnerability to exploit the system to their advantage, intensify chain development and management activities that enhance the poor resourced members' income earning capacity through increased productivity and efficient marketing of produce or product. Consequently, the project managers of the chain should ensure that extension services are improved to deliver project objectives that improve capacity to meet buyers' requirement in terms of volumes and quality of product, and finally chain managers should encourage financial institutions associated with the economic activities of the chain to institute regular training programmes on credit management to equip chain actors to use credit wisely.

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OPERATING RESULTS OF SILAGE ENTERPRISE OF A FARM - A CASE STUDY

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Abstract: *Improvements in agriculture has been focusing on innovations to improve the efficiency of the activity by making the traditional production structure currently in use more flexible and by making the necessary technological changes for farmers with large areas and the necessary machinery and equipment. Farms with significant arable land are able to offset the effects of changes affecting efficiency and profitability. The decisive sector of agriculture in Hungary is crop production, therefore its performance is largely determined by the annual output of the crop sector and the volatility in prices. From the farm data, we calculated farm-level results that support the need for machinery modernisation efforts, as precision tools and improvements already started in maize production can be applied fruitfully even in the light of the increasing frequency of negative climatic effects. During the development of silage maize cultivation technology, the achievements of precision farming were applied. Differentiated nutrient replenishment and sowing operations were used, in addition to the fact that harvesting was also documented. We set ourselves the goal of analyzing the management data of the study period between 2019-2022 in order to reveal the nature of the changes that occurred in terms of production value, production cost, and income, as well as the components that shape them. The presented values are average values of such conditions which are also suitable for crop-level conclusions. At the same time, they can be used to identify sector-level challenges and trends.*

Keywords: *silage production, site-specific technology, costs, gross margin*
(JEL Code: Q12)

INTRODUCTION

Maize is the world's largest cultivated crop. In Europe, France with its 3.2 million hectares has the largest maize-growing area, of which the silage maize area is around 1.3 million hectares each year. Germany follows with 2.4 million hectares, of which 1,5 million hectares are used to produce silage maize. In Hungary, maize is grown on 1.2 million hectares each year, of which 1.1 million hectares are grain maize and over 80 thousand hectares are used to produce silage one. Silage is a critical input to milk production. Dairy cattle farmers have long struggled with low milk buying-in prices, which draws the attention to explore all options to reduce their impact. As milk prices are independent of them, they are looking

at the costs of milk production and how it can be reduced by influencing input costs. Almost half of the total cost price raw milk is the feed cost, in which the bulk feeds such as silage produced in-house account for a large proportion. By using maize silage, which is the basis of domestic recipes, farmers have a direct impact on nearly a quarter of these costs. Modern hybrids today is not about high green yields. Meeting the needs of dairy cattle farmers must produce silage maize hybrids with excellent feed value. Dry matter yield, energy content and digestibility of silage all have an impact on the economics of milk production, increasing milk yield and reducing the cost price. That highlights the production technology and the demand for continuous improvement in production technologies of inputs that conributes to the overall efficiency of farming as a constant demand from management point view (SZŰCS-FARKASNÉ FEKETE, 2008; BOIKO, 2019). SMUK et al. (2009) revealed the relationship between the returns on precision farming as a modern approach and farming assets and the size of farming, highlighting the farms with larger croplands are able to offset the change in yield or the expected interest level. KALMÁR et al. (2004) stated in relation to precision technology that this is a reasonable alternative for farms only with over 1000 ha crop land. Bulky material such as harvested maize for silage demands for transporting large quantities over long distances relatively, which needs additional capacities (HUSTI 2007). To improve the perfomance when cultivating crop lands on the spot, farmers must develop suitable field (soil etc.) conditions as possible or organise several shifts or even by blocking (HUZSVAI et al, 2012). KEMÉNY et al. (2017) analysed farming performance of different sizes including farms with over 1,000 hectares and smaller ones as well, drawing the attention to those cultivating smaller areas being capable of generating positive returns as well. Since agriculture performance is largely determined by the annual output of the crop production in Hungary (POPP et al., 2019), flexible operation should be a constant aspiration for the productivity of the plant growing sectors and to increase their competitiveness (FELFÖLDI, 2013), taking into consideration the framework given by the natural-economic environmental factors. This can improve the product chain operation by its better flexibility that is highly expected in the agri-food sector as well (YOUSUF et al. 2022).

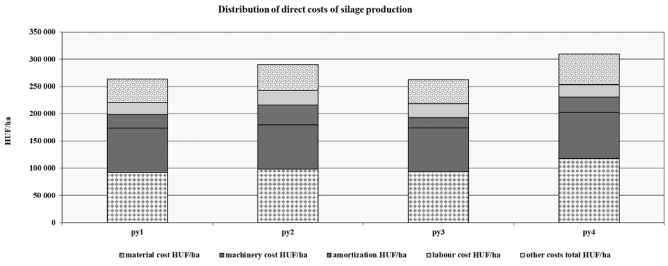
MATERIALS AND METHODS

During the development of silage maize cultivation technology, the achievements of precision farming were applied. Differentiated nutrient replenishment and sowing operations were used, in addition to the fact that harvesting was also documented. In addition to the base fertilizers, top fertilizers were also applied in a differentiated and positioned manner in several rounds in the years of experiment. Collected data came from production technology and enterprise management data for the years 2019-2022, in order to evaluate the efficiency of production by a complex economic approach of its technological process (APÁTI et al. 2010; SULYOK et al. 2013; Zhang – Kovacs, 2012). Recording the material costs, machinery costs, labour costs and other direct costs, the sectoral cost-income analysis was carried out for silage cultivation technology variants. From the enterprise data, farm level results compiled according to the crop structure were calculated (KAY et al.1994). The basic data used for the study were collected and processed annually. Based on this that data set, we compiled a breakdown of value, cost, and income data and the components that make them up, which represented the initial data. This included not only basic data, but also derived data, which were examined to evaluate the main management indicators.

RESULTS AND DISCUSSION

First, the cost data used during the investigation will be presented. The direct cost is related to the basic activity of the organization, it is directly related to the production of a product. The following graph (Figure 1.) shows the distribution of direct costs. In the examined period (2019-2022), the amount of direct costs was between HUF 260,000 and HUF 310,000. The largest proportion was represented by raw material costs and machine costs. These two items account for more than 50% of direct costs. The raw material cost includes the cost of organic fertilizer, seed, artificial fertilizer and plant protection product. The cost of machinery includes variable costs related to the machinery, the cost of the activity and the cost of external machinery services. The depreciation cost does not vary greatly between the years under examination. The cost breakdown represents the usual and accepted ratios in the sector. Raw material costs showed a significant increase during the last year, partly due to the incredible price increases in the sector. Overall, input prices in agriculture rose by 41%. The dramatic price rises in recent years have been caused by a combination of factors. A Europe-wide drought due to unfavourable weather conditions reduced yields, which caused price increases. The supply and demand shocks caused by the Covid19 epidemic have not yet been resolved. International demand for fodder crops has continued to grow. Energy prices have risen in parallel with the economic recovery.

Figure 1: The Triple bottom line sustainability model

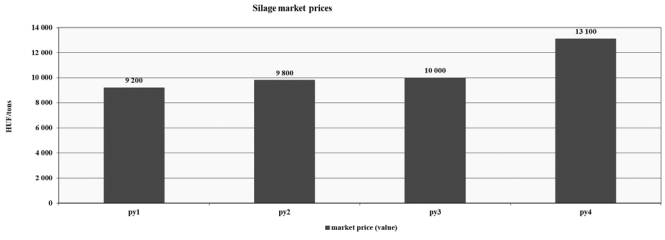


py=production year
Source: Author's own construction

The following graph (Figure 2.) shows the change in the market price of silage during the examined period. There was a minimal price increase in years 1-3 of the study. In 2022, the drought in Europe will directly affect the presence of moulds and mycotoxins. Mycotoxins are produced by certain types of moulds that affect feed quality and performance. As a result of

the 2022 harvest, prolonged heat and drought resulted in very high aflatoxin contamination. High levels of contamination may have been behind the significant price increase (around 24% compared to the previous year) as the supply of quality silage was limited due to the drought.

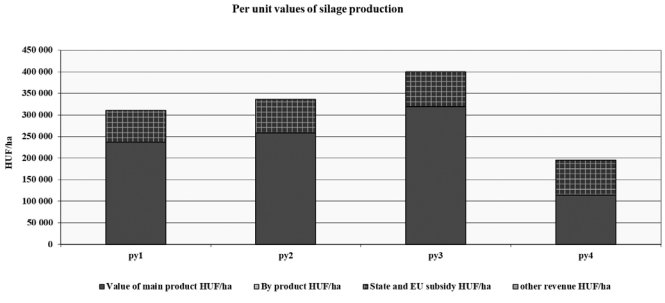
Figure 2. Silage market prices



py=production year
Source: Author's own construction

The third graph shows the unit value of silage production per hectare. As in the previous results, negative values are shown for the year 2022. The graph also shows the value of the main product by product revenue and other revenue. These items have a value of 0 in the database. The production value per hectare shows an increasing trend in the first three years. It has varied between 300 000 and 400 000 HUF. Compared to the first year, the third year shows an increase of 25.6%, due to both the increase in yields and the increase in market prices. The fourth year value of main product shows 51% decrease compared to the first year under review and a 64% decrease compared to the third year. Production fell by nearly a third to about a third in a critically dry, drought-stricken year. Although market throughput increased, yields were critically low. Production value data are shown in Table 1. We can see that the yield in the fourth year was 8.7 t/ha.

Figure 3. Per unit values of silage production



py=production year
Source: Author's own construction

The following figure (Figure 5.) shows the gross margins of silage production. The term gross margin refers to a profitability ratio that examines a company's gross profit relative to revenue or sales. The company's gross margin is expressed as a percentage. Gross profit is determined by calculating gross sales. The higher the gross margin, the more capital the company has left, which it can then use to pay

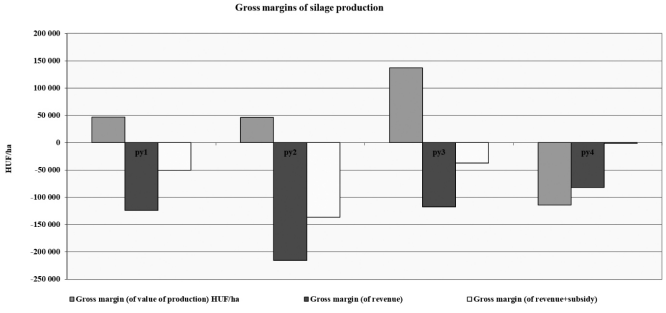
Table 1. Value of main product

Denomination	Unit of measure	py1	py2	py3	py4
Value of main product	HUF/ha	237 176	257 740	319 000	113 970
Average yield	t/ha	26	26,3	31,9	8,7
Market price (value)	HUF/t	9 200	9 800	10 000	13 100

py=production year
Source: Author's own construction

other expenses or meet debt obligations. The first column shows the gross margin per hectare. The difference between the first and the second year of the study is minimal, but in the third year it almost triples. Gross margin (of value of production) was highest in the third year. In the fourth year it becomes negative. Gross margin of revenue is negative in all the years under review (total income of enterprise - total direct costs). The third column shows gross income per value of production plus subsidies. It was highest in the fourth year, as that year saw a doubling of state and EU subsidies compared to the previous three years due to the critical drought (drought damage).

Figure 5. Gross margins of silage production



py=production year
Source: Author's own construction

The fourth year was a year of critical failure. State and EU subsidies have helped somewhat to mitigate the drop in profitability, but the figures perfectly reflect the damage caused by the drought. The following table (Table 2.) compares the average figures for years 1 to 3 with the results for year 4. We can see that the direct cost elements represent similar proportions on average over the three years compared to the fourth year. In the first-three years, the value of main product was 78% (271 305 Ft/ha) of the production value (348 905 Ft/ha), while in the fourth year it was 20% less, 58%. The State and Eu subsidy was 42% of the production value (81 300 Ft/ha), as the yield was less than a third (average 28 t/ha > 9 t/ha). In 2022 grants represented for 42% of revenue. Examining direct costs probably due to the precision equipment, machinery costs were 3% lower in the fourth year compared to the three-year average and labour costs were 2% lower. The direct cost averaged 92% of total production costs over the three years. In the fourth year it was 94%. The Delta column shows the absolute difference between the periods under consideration, while Delta% shows the magnitude and direction of change.

Table 2. Summary table

Denomination	m.u.	py1-3		py4		Delta	Delta %
value of main product	Ft/ha	271305	78%	113970	58%	-157335	-0,58
average yield	t/ha	28		9		-19	-0,69
market price (value)	Ft/t	9667		13100		3433	0,36
by poduct	Ft/ha	0	0%	0	0%	0	0,00
State and EU subsidy	Ft/ha	77600	22%	81300	42%	3700	0,05
other revenues	Ft/ha	0	0%	0	0%	0	0,00
Value of production	Ft/ha	348905	100%	195270	100%	-153635	-0,44
material cost	Ft/ha	94463	35%	117960	38%	23497	0,25
machinery cost	Ft/ha	81308	30%	84320	27%	3012	0,04
amortization	Ft/ha	26491	10%	28281	9%	1790	0,07
labour cost	Ft/ha	24852	9%	23099	7%	-1752	-0,07
other costs	Ft/ha	43200	16%	55881	18%	12681	0,29
Total direct cost	Ft/ha	272246	100%	309541	100%	37295	0,14
Gross margin (of value of p	Ft/ha	76660	100%	-114271	100%	-190931	-2,49
Indirect cost of enterprise	Ft/ha	5575	24%	2621	13%	-2953	-0,53
Overheads (farm)	Ft/ha	18074	76%	16859	87%	-1214	-0,07
Total indirect cost	Ft/ha	23648	100%	19481	100%	-4168	-0,18
Total direct cost	Ft/ha	272246	92%	309541	94%	37295	0,14
Total indirect cost	Ft/ha	23648	8%	19481	6%	-4168	-0,18
Total cost of enterprise	Ft/ha	295894	100%	329022	100%	33128	0,11
Net profit margin	Ft/ha	53011	100%	-133752	100%	-186763	-3,52

py=production year
Source: Author's own construction

CONCLUSIONS

Initially, the crown virus pandemic in 2020 did not have a significant direct impact on the natural output of agriculture. Overall, despite the negative effects of the epidemic, agriculture had an average year, as shown in the yield table. However, there were difficulties in marketing and the sector was not spared logistical problems, stricter safety standards, financial difficulties and labour shortages. What can also be seen from the farm data is that the extreme economic and market changes have had a major impact on the agricultural input markets, with fertiliser, seed and pesticide use facing significant price increases. The military conflict has further disrupted the market, and the data for the 4th pilot year perfectly reflect the consequences of the historic drought that has hit domestic agriculture, giving a new impetus to price increases. The conclusion of the study is that, based on the analysis of the four years, there are some factors that show drastic changes, but there are also some factors that have not developed negatively despite the unfavourable market and economic conditions.

In crop lands with good fertility, good crop yields were harvested even with the use of traditional and differentiated sowing and nutrient management. In this case the decisive influencing factor was the available absorbable soil moisture content. On the other hand, in the experimental areas with more heterogeneous soil properties, it was the differentiated cultivation technology that resulted in additional yields even in the year with less precipitation. These effects were reflected in the figures and influenced the management indicators.

Farmers developing a plan to manage farm businesses also have to figure out the technology, which may be different from one plots to another. The presented values in this paper are average values, which are also suitable for crop-level comparisons. At the same time, they also help to recognize national sector averages and trends. In the case of a given economy, these values may be very telling.

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TRENDS IN HONEY CONSUMPTION AND PURCHASING HABITS IN SOME EUROPEAN COUNTRIES

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Abstract: *Honey is a staple food of animal origin with many beneficial properties. Hence, studying consumption and purchasing habits is an important issue. Our research aims to present the market situation and conditions of the domestic beekeeping sector from the consumer's point of view. We considered it appropriate to present the beekeeping market because the European Union is the second largest honey producer in the World, and Hungary is one of the largest honey producer in the EU. Thus, global and EU trade changes, market trends and changes in consumer habits are significant factors influencing the domestic situation. The research aims to find out the direction of honey consumption and purchasing patterns and trends in European honey consumption. The market situation is presented through a review of the relevant domestic and foreign literature, and statistical databases (EU Member States' honey programmes, KSH, OMME, Statista databases and reports) are analysed. We chose an online questionnaire survey method to assess consumption and purchasing habits in Hungary and present the results in comparison with similar Hungarian studies. To analyse the situation in Europe, we have collected and analysed relevant research reports and primary and secondary studies from several EU countries. Finally, the data from each country are compared, highlighting similarities and differences, to define a typical European honey consumer profile.*

Keywords: *honey, honey consumption trends, purchasing habits, European countries*
(JEL code: M31)

INTRODUCTION

The literature on food consumption, health and the environment is increasingly interconnected (Kiss et al., 2019; Bauerné Gáthy et al., 2022). In recent years, consumer preferences in nutrition have been influenced by new factors such as health and environmental consciousness (Bauerné Gáthy et al., 2021) or ethical production processes (Balsa-Budai - Szakály, 2021). Honey, which is part of a healthy lifestyle, contributes greatly to the proper functioning of the immune system, is an important part of a healthy diet as a functional food, a valuable and rich source of biologically active substances (Ćelan et al, 2022). Honey is undoubtedly a product of trust, and the direct relationship between beekeepers and consumers is growing because of increasing direct sales by producers. Consumer confidence is increasing, leading to a continuous rise in the volume sold (AM, 2019).

Honey is the oldest known sweetener, and its medicinal use dates back to 1550 BC in ancient Egypt (Weiner Sennyei, 2022). Beekeeping was also a well-known profession among the ancient Greeks, to the extent that they had a god, Aristheus (Feketéné Ferenczi et al., 2021A). Following the EU Directive, the Hungarian Food Guide defines honey as "the natural sweet substance collected by Apis mellifera bees from the nectar or sap of living plant parts or from the secreted material of living plant parts by insects sucking plant sap, which is collected by bees, transformed by the addition of their material, stored, dehydrated and matured in spleens" (Food Guide, 2002). The transformation of nectar into honey is a highly complex process. The bees first collect the nectar from the flowers and ripen it by partial ripening, after which it undergoes enzymatic digestion in the bees' stomachs. The mature nectar is dried by evaporation until the honey has a moisture content of around 13-18% (Mijanur Rahman et al., 2014).

The benefits of consuming honey as food goes far beyond its use as a sweetener (FAO, 2019). In contrast to most sweeteners, it contains, in addition to carbohydrates (fructose, glucose), vitamins, various enzymes (substances that regulate the transformation of sugars), characteristic aromas of its origin, flavours, minerals, trace elements necessary for life processes,

liver and kidney protective hormones, antiseptics, anti-inflammatory substances, a total of about 181 known components (Örösi, 1967; Vallianou et al., 2014, Urbánné Treutz - Treutz, 2017). The beneficial effects of honey on the human body have been demonstrated by several studies (Bilsel et al., 2002; Lusby et al., 2005; Kantar, 2016; Meo et al., 2017; Pasupuleti et al., 2017; Cianciosi et al., 2018; Testa et al., 2019; Kafantaris et al., 2021; Marić et al., 2021). Therefore, honey consumption has many physiological benefits, is becoming increasingly popular with consumers, and has a wide range of uses (natural sweetener, food, medicine, and beauty care) (Yeow et al., 2013). This is why honey has become the third most frequently adulterated food in recent decades, after olive oil and milk (Feketéné Ferenczi et al., 2021A). Due to the different types of counterfeits, the investigation of the quality and origin of honey is a significant challenge (Soares et al., 2017). In addition, the pollination activity of bees contributes to the maintenance of biodiversity, affects agricultural production in terms of quantity and quality (Vrabcová - Hájek, 2020) and the sustainability of the apiculture sector (through income-generating activities) (Vida - Feketéné Ferenczi, 2022). We, therefore, consider it necessary to perform an overview study, which identifies and compares European consumers' consumption habits and their expectations of the product, since the benefits mentioned above would be necessary to promote honey consumption and establish the honey culture. In order to do this, we compare the production and consumption data of some European countries, highlighting the similarities and differences.

Honey production and honey consumption

Bee colonies are vital for agriculture and the environment. In addition to honey and other bee products (e.g. pollen, royal jelly, propolis), bee colonies play a unique role in pollination along with other insects, biodiversity and landscape conservation, environmental protection and rural development; beekeeping is an excellent work in the open air and a source of income that can reduce the rural population's migration to cities (Popescu, 2017; Ferenczi et al., 2021A). Environmental, geographic and climatic conditions can vary honey's pollen content and relative humidity. Among products of animal origin, honey is not the only one that has to face consumption restrictions due to different cultural and religious habits (Vida - Szűcs, 2016A, Vida - Szűcs, 2020). Honey is produced on all five continents, and its consumption varies from country to country due to cultural reasons and dietary habits (FAO, 2019).

Based on the literature, there were around 94 million beehives worldwide in 2020, compared to 80 million beehives in 2010. Global honey production volume peaked in 2017 at around 1.88 million tonnes and has since declined to around 1.77 million tonnes. The global honey market is estimated to be worth around $8 billion in 2020 (Statista, 2022).

Asia, specifically China and India are the main drivers of international honey production (China will have a 27.42% share of global honey production in 2021) and have consolidated their production leadership in recent years, with an average annual increase in honey production of over 10,000 tonnes. In contrast, other regions of the World, such as Europe and the Americas, have seen production growth of fewer than 2,000 tonnes per year (FAOSTAT, 2022). According to Statista, 2023, China was the World's leading natural honey producer in 2021. China produced more than 472,000 tonnes of honey, almost five times higher than the amount produced in Turkey, which was second in that year.

Beekeeping is common to all EU countries and is characterised by a diversity of production conditions, yields and beekeeping practices. The EU is the second largest honey producer after China. However, it is also a net importer of honey from third countries. The EU countries with the most significant honey production (Romania, Spain, Hungary, Germany, Italy, Greece, France and Poland) are mainly located in Southern Europe, where the climate favours beekeeping. Besides honey, the EU produces many apiculture products, including pollen, propolis, royal jelly and beeswax. All honey marketed in the EU must fulfil the quality and labelling rules in the Honey Directive (2001/110) (The Council of the European Union, 2002).

In Figure 1, we can see the significant honey producer countries. Figure 1 contains the data in tonnes, so we can see with burgundy those countries whom average honey production is the highest, above 20,258 tonnes. This figure is based on the average production from 2012 to 2021.

Figure 1: Production quantities of natural honey by country (2012 – 2021 average)

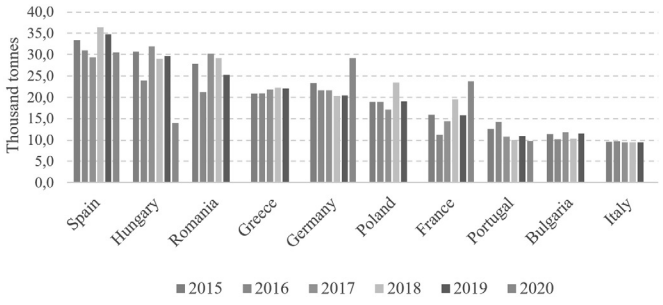
Source: FAOSTAT, 2022

The European Union is one of the World's largest honey producers and the largest importer of honey. However, according to FAOSTAT, 2022, the amount of honey produced in the EU-27 Member States has decreased in recent years, reaching 217.9 thousand tonnes in 2020, compared to 249.1 thousand tonnes in 2018 and 225.8 thousand tonnes in 2019 (FAOSTAT, 2022).

EU is only 60% self-sufficient in honey, so imports are needed to cover the EU's domestic consumption. The leading suppliers of imported honey are Ukraine (31%) and China around 28% of EU imports (EC, 2022).

The following figure (Figure 2) shows the leading producer within the European Union. As shown in Figure 2, each year, the leader in Spain, Hungary, was the second-largest honey producer in the EU in 2015 and 2017 and the third-largest in 2018.

Figure 2: The EU's largest honey producers 2015-2020



Source: own construction based on FAOSTAT, 2022

Beekeeping has a significant place in EU agriculture, mainly because the demand for honey is constantly growing. In 2019, the biggest consumers of honey were Germany (69 thousand tonnes), France (52 thousand tonnes) and the United Kingdom (45 thousand tonnes), accounting for 38% of the EU's 28 consumption. In addition, other countries such as Spain, Poland, Italy, Greece, Romania, the Netherlands, Portugal, the Czech Republic and Croatia accounted for 47% of total EU consumption.

The EU average per capita consumption of honey is 1.7 kg/person/year, compared to a global average of 250-300 grams per capita. In terms of average annual per capita honey consumption, Croatia (2.59 kg/person/year) and Greece (2.47 kg/person/year) are the leaders. Below the average are Romania (1.3 kg/person/year) and Austria (1.2 kg/person/year), followed by Germany and Hungary, where the consumption of honey is similar, almost 1-1 kg/person/year (BMEL, 2021). Even lower in Sweden and Finland, 0.8-0.8 kg/person/year (Jordbruksverket, 2021; Natural Resources Institute Finland, 2021). Spain, the largest European honey producer, has a per capita honey consumption of only around 0.4 kg (Mercasa, 2020; Gedeon et al., 2020; Popescu et al., 2021). In the case of Hungary, honey consumption has been increasing from 0.3 kg/person/year in 2010 to 0.8 kg/person/year in 2018. If per capita honey consumption increased by ten dkg annually, an extra 1,000 tonnes of domestic honey could be safely marketed (Feketéné Ferenczi et al., 2021B).

In 2020, there were 615,000 beekeepers in the EU with 18,926,000 hives, with the highest numbers in Spain (2,967,000 hives), Romania (2,247,000 hives) and Poland (1,766,000 hives) (EC, 2022). Overall, the number of hives in European apiaries increased by 3.9% compared to the previous year. There has been a decrease in Hungary, as the number of hives fell from 1,206,000 in 2019 to 1,163,000 in 2020, according to the domestic autumn monitoring surveys. Bee density has also decreased from an average of 13.44 hives/km2 in 2017 to 12.5 hives/km^2 in 2020 (OMME, 2021).

In Hungary, despite its small size, the beekeeping sector is of crucial importance for agriculture (Halmágyi - Zajácz, 2008), both in terms of its contribution to the gross production value of agriculture and its contribution to the value of livestock production.

In Hungary, the production difficulties experienced in the last three years (e.g. changes in weather conditions), the difficulties in dealing with the difficult bee health problems, and the adverse effects of plant protection are reflected in the volume of domestic honey production. The highest honey production was 32 thousand tonnes in 2017, which according to KSH data, was 18 thousand tonnes in 2019 and only 14 thousand tonnes in 2020 (KSH, 2022).

A specific feature of Hungarian honey sales is that 64-66% of the honey produced is sold to wholesalers in barrels, 30% directly to consumers, 3-5% is packaged for retailers and shops, and about 1% is sold for industrial use (AM, 2019).

The evaluation of Hungarian consumption and purchasing habits is presented based on a questionnaire survey, which was conducted to find out how and in which direction honey consumption and purchasing habits have changed in Hungary today and whether there are regional differences in the respondents' answers.

The study's primary aim is to present the evolution of honey consumption in some European countries, especially in Hungary and neighbouring countries. Furthermore, the study aims to identify a typical European honey consumer profile based on the results.

MATERIALS AND METHODS

For the present publication, we used documentary analysis. This qualitative method is a research method that allows the analysis of a material, a written text so that its entire content is considered and conclusions can be drawn. We also reviewed statistical databases on the subject (European Union Member States' Beekeeping Programmes Data, FAOSTAT, EUROSTAT, KSH, OMME, Statista) and other documents (e.g. publications, studies, reports). By analysing the statistical sources and documents used, and the results, reports and experiences to date, we have formulated the causal links, drawn conclusions and made recommendations for the sector. Many sectoral analyses and studies have been conducted using similar methodologies (Tikász et al., 2008; Szűcs et al., 2008; Szakály et al., 2009; Vida, 2013; Szigeti et al., 2014; Kiss et al., 2016; Vida - Szűcs, 2016B).

Honey is a key food of animal origin and has a number of beneficial properties, so the study of consumption and purchasing habits is an important issue. The research provides an overview of the situation, consumer habits, trends and consumers of honey consumption in national and international markets. The online questionnaire was structured according to the 4Ps of the marketing mix, with questions on honey as a product, the way and frequency of honey consumption (Product), its price (Price), place of purchase (Place), and promotional opportunities (Promotion).

The results obtained from the sample were evaluated, subjected to descriptive statistical analysis, and then analysed for associations based on background variables, including gender, age, education, type of locality, and county. Our online survey, conducted between February 2022 and April 2022, received 272 responses (n=272). Responses were evaluated using SPSS 22.0 data analysis and statistical software, and the results are not representative. The statistical data were supported and compared with related current research findings collected from relevant literature sources.

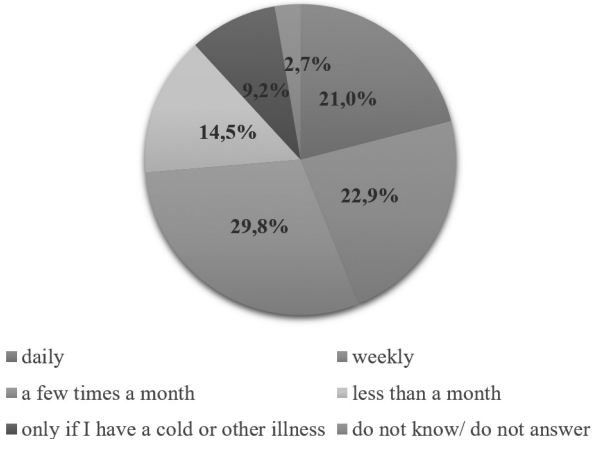
RESULTS AND DISCUSSION

We start with the analysis of Hungary because our primary research focuses on Hungarian consumption patterns. Our first question was whether the respondents usually consume honey. 43.8% of the respondents consider themselves regular honey consumers, 48.9% are occasional honey consumers, and 7.4% do not consume honey. Overall, 92.7% of respondents consume honey with some frequency, so the responses suggest that honey is a popular and frequently consumed product.

The next question asked respondents about the frequency they consume honey (Figure 3). This question, linked to the previous question, further breaks down what respondents mean by regular and occasional consumption. The highest proportion consumed a few times a month (29.8%), followed by weekly (22.9%) and daily (21.0%). Analysing the responses, we find that the proportion of respondents who consume honey daily and weekly is 43.9%, the same as the proportion who consume honey regularly in the previous question. The combined proportion of those who consume honey a few times a month (29.8%) and less than a month (14.5%) is 44.3%, which is very similar to the proportion of occasional honey consumers in the previous question. Thus, respondents understood regular honey consumption to mean daily and weekly and occasional honey consumption to mean consumption once a month or less. Overall, it is also an essential finding that nearly 44% of respondents consume honey at least once a week, so the findings from the literature review that the number of honey consumers is increasing year on year seem to be confirmed in our sample.

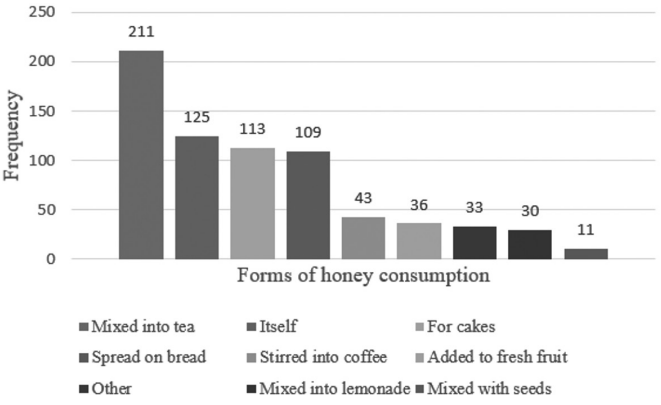
Oravecz - Kovács (2019) also conducted qualitative interviews in Hungary in 2017 (n=86), in which the respondents consumed and purchased honey at least monthly. Their results confirmed Lászlóffy's (2014) earlier findings that consumers' perception of honey has improved in recent years, honey consumption has increased, and respondents perceived honey as a healthy and natural sweetener.

Figure 3: Frequency of honey consumption among honey consumers (n=262)



Source: own estimates based on questionnaire data, 2022

Figure 4: How do you usually consume honey? (n=264)



Source: own estimates based on questionnaire data, 2022

A representative survey (n=1385) by Oravecz - Šedík (2022) found that a significant proportion (96%) of respondents had consumed honey in the form of honey bread or honey tea as children. Respondents consume significantly more honey in the winter (48.3%), in the autumn (30%) and during the Christmas festive season (29.1%). When looking at the frequency of consumption, it was found that the majority consumed honey several times a month (29.2%) or several times a week (24.7%), with 16.5% consuming honey daily. Based on the respondents' answers, their annual honey consumption is estimated at 2 kg per person and around 6 kg per household. Honey consumption is typically associated with breakfast, but there is also significant consumption during dinner. Most respondents (55%) consciously use honey as a healthier substitute for sugar (Oravecz - Šedík, 2022).

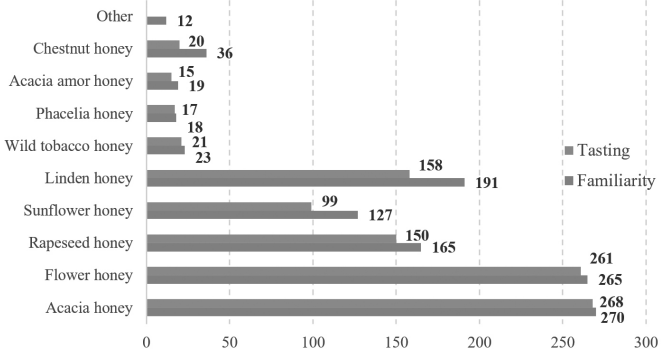
After analysing the frequency of consumption, we wanted to know in what form respondents prefer to consume honey, where they were allowed to select more than one response option, so in Figure 4, we have shown the number of responses rather than a percentage. Figure 4 shows that respondents most commonly consumed honey mixed in tea (211), with consumption on its own also popular (125), followed by the option of mixing it into cakes (113) and spreading it on bread (109). Interestingly, mixing it in coffee, adding it to fruit, and mixing it in milk or even in lemonade is also popular. Overall, the responses show that honey is becoming increasingly popular in the diet, and respondents are finding more and more alternative uses for honey, which could ultimately increase the frequency of consumption.

Oravecz - Šedík (2022) also examined how the respondents consume honey. In their survey, the most popular use is to flavour drinks (51.3%), followed by direct consumption (19.1%) and spreading on bread, added to pancakes, fruit, and yoghurt (17.8%). Baking and cooking have a minor use (9.1%). In contrast, honey is used for other purposes (honey-containing medicinal preparations, cosmetics) by 2.7% of the respondents (Oravecz - Šedík, 2022). In another question, 65.7% of respondents mentioned that they regularly add honey to tea and coffee (Oravecz - Šedík, 2023A).

Figure 5 includes two questions asking which honeys the research participants know and have tasted. It can be seen that acacia honey and mixed flower honey are the best known and tasted the most, with awareness and tasting of these two types of honey showing a strong correlation. The popularity of acacia honey is also because it has been considered a Hungaricum in Hungary since 2014. Linden honey is also one of the better-known types of honey, but fewer people have tasted it than have heard of it. In the case of rapeseed honey, there is little difference between familiarity and taste. At the same time, sunflower honey is also well known but a less tasted type. The least-known types of honey are chestnut honey, phacelia honey and wild tobacco honey. Figure 5 shows that few respondents knew and tasted them.

In Oravecz - Šedík (2022) survey, they found that acacia honey is the most popular type of honey among Hungarian consumers (46.1%), followed by mixed flower honey (14%), linden honey (9.5%), rapeseed honey (4.5%), while the least popular are silk grass honey (2.2%), pine honey (1.9%), chestnut honey (1.2%), sunflower honey (0.8%), other (1%). The survey shows that Hungarian consumers are willing to try different flavoured kinds of honey (Oravecz - Šedík, 2022; Oravecz - Šedík, 2023A).

Figure 5: Tasting and familiarity of different honey types by the respondents (n =270)



Source: own estimates based on questionnaire data, 2022

Concerning the consumption of honey, we also asked respondents which packaging they prefer to consume honey. Most respondents consume honey from the jar they buy (86.9%), with very few respondents putting it in their own jar or honey jar. Nevertheless, the honey jar's appearance is essential, as it can communicate and inform the consumer during the purchase. Glass packaging also has a lower environmental impact and is, therefore, preferable to plastic packaging (Vuk et al., 2023).

The next question was about which other beekeeping products, besides honey, were known to the research participants. Among the answers, the highest number of answers was given to pollen (193 respondents), beeswax (187 respondents), propolis and royal jelly (184-184 respondents); 29 respondents mentioned bee venom, while 1-1 respondent also mentioned splenic honey, honey bread and honey wine. 33.1% of the respondents regularly use a beekeeping-related product for health problems. This leads to the conclusion that respondents are well aware of other beekeeping products related to honey, which may increase the demand for honey and beekeeping products.

The next section of questions is to explore the buying habits of honey. Based on the answers to our question ("How often do you or a family member buy honey?") (n=263), we found that most people buy honey quarterly (36.9%) and monthly (30.0%). However, the results also include a significant proportion of people who buy honey less frequently (17.5%). Those who do not buy honey (14%) mainly get it as a gift, find it expensive or produce it. We also had a question about the packaging of honey; nearly 56.0% of respondents mostly buy the product in 1 kg jars, and even 40.0% of respondents chose the half kg jar.

Oravecz - Šedík (2023A) also examined honey purchasing habits and the factors influencing purchasing. The authors found that 83.9% of respondents buy honey. In comparison, the remaining 16.1% do not buy honey themselves but from a family member or receive it as a gift. Most people buy honey when they run out or need it (41.2%), typically every three months (22.2%) or every year (13.4%), with the fewest (7.1%) buying honey monthly. The majority buy honey in 1 kg packages (41.3%), followed by 2-5 kg (19.4%) and 0.5 kg (13.9%). The minor proportions were those buying 0.25 kg (5.1%) and 4.1% buying more than 5 kg.

Table 1 shows the aspects that are considered necessary when purchasing honey. Statements were made and rated on a Likert scale from 1 to 5, where "1=not important" and "5=very important". The responses to the questions were subjected to descriptive statistical analysis. The mean and standard deviation were calculated along with the number of items. Based on the data from the questionnaire, the results were ranked according to the mean, thus finally obtaining the criteria necessary for the respondents when making a purchase. They

Table 1: Important aspects of purchasing honey (n=256)

Descriptive statistics			
	N	**Mean**	**Standard deviation**
It comes from a reliable source.	256	4,68	,937
It should be delicious.	256	4,64	,931
It controlled hygienic conditions.	256	4,46	1,109
Be a domestic product.	256	4,39	1,166
The label should state the producer.	256	4,22	1,204
It should frequently be flowing.	256	3,93	1,157
It is not crystallised.	256	3,82	1,448
Be clearly visible.	256	3,81	1,276
Practical packaging.	256	3,41	1,243
Organic quality.	256	3,36	1,257
Tasteful packaging.	256	3,23	1,258
Glass tubes should be usable for other purposes.	256	3,05	1,390
As cheap as possible.	256	2,53	1,328
It comes from a reliable source.	256		

Source: own estimates based on questionnaire data, 2022

were reliable, delicious, produced in controlled and hygienic conditions, domestic product (with the producer's name on the label), flowing, not crystallised, clearly visible in the bottle and, finally, practical packaging. Hungarian consumers are well informed about honey crystallisation, as the vast majority of respondents know that it is a natural process and does not affect the quality of honey. It is also likely that the information they received when buying from the producer helped them to be well informed. Overall, it can be concluded that, besides taste, production conditions are the most crucial factor when purchasing honey.

Comparing our questions with the survey of Oravecz - Šedík (2023B), we found similarities in honey purchasing habits. In their survey, the quality of honey was the most important factor (87.5%) and the taste of honey (83.4%). This is followed by the texture of honey (69.9%), type (69.6%), country of origin (67%) and producer (63.3%). Internationally, a similar trend is observed, with natural product characteristics (taste, colour, price, origin) being more important than brand, trademark, packaging and advertising.

The next set of questions is related to the price of honey. First, the affordability of the price of honey asked: 70.0% of the respondents think that honey is affordable today. Most of them buy honey for between 2,000 and 3,000 HUF (43.3%), but 24.4% spend up to 3,000 HUF on honey. Among the responses, 15% answered, "I do not buy honey" (11.8%) because they get it as a gift or produce it themselves. The remaining percentages answered "I do not know/dot no answer" (5.3%). Then we analysed "Would you be willing to pay a higher price for honey from a Hungarian producer?" and more than one-third of the respondents answered yes, which means that respondents have a positive attitude towards Hungarian honey.

The survey of Oravecz - Šedík (2023A) found that, on average, respondents are willing to pay between 2,300-3,300 HUF for 1 kg of honey (67%). 9.5% of respondents are willing to pay up to 3,800 HUF for honey, while 8.2% are willing to pay more than this for 1 kg of honey. 9.7% of respondents are willing to pay 1,800 HUF for 1 kg of honey, while 5.6% are willing to pay less than 1,800 HUF.

Among the questions on the place of purchase, we mainly wanted to ask where honey is bought. The 263 responses found that most people buy honey directly from the beekeeper at the market (129 people) or at home (127 people). Relatively many receive it as a gift (81 people) or buy it in hypermarkets and supermarkets (70 people).

Oravecz - Šedík, 2023A found regarding the place of purchase, it is clear that honey is mainly purchased directly from beekeepers (50.3%), followed by honey from farmers' markets and fairs (43.5%). Fewer people (32%) buy honey from shops, and the least commonplace of purchase is the Internet (13.7%).

When examining our questions on promotion, the survey asked the respondent, "Have you ever seen an advertisement promoting honey consumption?", 32.2% of respondents had seen an advertisement promoting honey consumption, 62.8% had not, and 5% did not know the answer—those who had seen such advertising, mainly on the Internet, social media or TV.

Oravecz - Šedík (2023C) asked consumers where they get their information about the beneficial physiological effects of honey. A significant proportion of respondents obtained information from the Internet (38.3%) and from exhibitions, fairs and farmers' markets. The role played by books, professional publications, newspapers, television, doctors, dieticians, educational institutions or radio is significantly smaller.

Poland

Kowalczuk et al. (2023), in a study of the behaviour of Polish honey consumers (n=434), found that nearly 90% of respondents consume honey, 21.2% of respondents consume honey once a month on average, and 20.28% consume honey daily or almost daily. The frequency of several times a month (19.82%) and several times a week (19.12%) was selected by 19-20% of respondents. Analysis of the changes in the frequency of honey consumption during the COVID-19 pandemic showed that 34% of respondents even increased their honey consumption. The COVID-19 epidemic has shaped our lives in the past few years. Many new restrictions and strict regulations accompanied it, and the consequences had to be dealt with in the World, which also affected everyone's life (Vida - Popovics, 2021).

According to a study by Roman et al. (2013), one in five people in Poland consumes honey daily, while Kopala et al. (2019) found that only 5% of Polish consumers do not consume honey. According to the Polish survey, women and higher-income earners use honey mainly in cakes, vegetarian dishes, desserts, fruit and vegetable preserves and hot drinks. Respondents over 46 years of age and those with higher education added honey to sandwiches, cheese, meat dishes, cold drinks and for direct consumption, compared to younger respondents who were more likely to add honey to desserts and hot drinks.

The analysis of the respondents' preferences regarding the type of honey used showed that multi-flower honey is consumed most often (80.2% of indications). Consumed much less frequently are linden honey (59.9%) and acacia honey (52.0%). The fewest respondents mentioned heather honey (24.7%) as their preference. The most critical factors for Polish consumers when purchasing honey are the type of honey, the method of production and the place of purchase. The factors that are less important in determining the purchase of honey are the type of packaging, the consistency of the honey, the price, the information on the label and the size of the packaging, with the least important factor being the attractiveness of the label. The place of production, the conditions of production and packaging are relevant for older people, those with higher education and incomes. In this survey, most respondents received honey from family and friends (49.0%) and bought it at a marketplace (40.3%). More than a third of the respondents indicated that they bought honey from an apiary, and nearly one in four respondents did so at a supermarket. Less-popular places of purchase included online shopping sites (16.4%) and neighbourhood stores (11.3%). Men are statistically significantly more likely to buy honey from neighbourhood and fruit and vegetable shops. At the same time, women are more likely to obtain honey from friends and

family. Younger people (18–46 years) are more likely to buy honey in markets, bazaars, and online. In comparison, older people obtain honey from family and friends (Kowalczuk et al., 2023).

Slovakia

Hudecová et al. (2021) surveyed the consumption of beekeeping products in Slovakia (n=332). The most consumed beekeeping product was honey, with only 12% of respondents claiming to consume other beekeeping products (e.g. royal jelly, propolis). For almost 90% of Slovak consumers, the whole family consumes beekeeping products. Guziy et al. (2017), who compared honey consumption in Russia and Slovakia, found similar results. In this case, 87% of Slovak respondents reported honey consumption by the whole family.

Among Slovaks, the reasons for consuming beekeeping products were: to strengthen the immune system (71%), for the honey's recognised medicinal properties (60%), to prevent illness (58%) and for its anti-inflammatory properties (36%). The most important factor for Slovak consumers when buying honey was the country of origin, followed by taste, type of honey and price. 27% of respondents consumed honey because of its taste. 62% of the respondents buy honey and other beekeeping products directly from domestic producers (Hudecová et al., 2021). The size of the honey packaging was rated as the least important factor, together with packaging and design (Guziy et al., 2017) and promotions and packaging materials (Hudecová et al., 2021).

When identifying the critical factors influencing the purchase of beekeeping products, the most crucial factor was quality, with 62% of respondents considering beekeeping products have better quality in Slovakia than those from foreign producers (Hudecová et al., 2021). In addition, according to the research by Wu et al. (2015), consumers agreed with the statement that locally produced honey is of better quality than imported honey. Thus Slovak honey consumers have positive attitudes towards domestic honey. The results of Hudecová et al. (2021) showed that most consumers consume honey all year round, and they identified acacia honey as the most preferred type. According to the survey, the optimal price for 1 kg of honey is between €7 and €10, purchased directly from beekeepers or in supermarkets, as retail stores offer quite a large variety of honey.

The Czech Republic

Šánová et al. (2017) examined the honey purchasing behaviour of consumers (n=234) in the Czech Republic from a different perspective. Their analysis was based on price, origin, type of honey and organic quality. The target groups of honey consumers studied were from Prague and the Central Bohemia region, representing the country's most considerable purchasing power. The research results showed that consumers are mainly interested in the price and origin of honey. An essential parameter for buying honey is the crystallisation of the honey. Although this does not affect the quality parameters of honey, it significantly impacts consumers' subjective perception of honey quality when buying honey in the Czech Republic. When buying honey, the most important factor is the origin of the honey (63.15%), followed by price (18.58%), crystallisation (8.20%), type of honey (6.19%) and organic quality (3.88%). The least popular is mixed flower honey from outside the EU, which is non-organic, crystallised and available at high prices. The ideal honey for consumers has the following characteristics: organic, non-crystallised (forest) honey from local Czech beekeepers, available at a price of up to CZK 120/kg. The sample shows regional differences in honey purchasing. Compared to respondents in Central Bohemia, respondents in Prague mainly consider price, crystallisation, organic quality and type of honey. 24% of respondents in Prague base their decision on price. Respondents in Central Bohemia pay almost no attention to the organic quality of honey, compared to respondents in Prague, who pay more attention to this. The purchasing preferences of consumers with different levels of education also differ. Respondents with a secondary education focus mainly on the origin parameter of honey (66.3%). Respondents with a university degree focus more on price (25.5%) than those with secondary education (18.6%). Furthermore, the crystallisation of honey has a more significant influence on the decision of high school graduates (9.6%) than that of respondents with a university degree (5.2%). High school graduates also focus more on the type of honey than those with a university degree. The organic quality of honey was not important enough for either group.

Another study highlighted, that 77% of Czech consumers who buy honey at least once a year. The consumers who buy honey directly from beekeepers do so for two reasons. On the one hand, it has a more favourable price and they believe that they can enjoy benefits when buying from the producer. Honey purchased from the producer is safer, healthier (because sweetening with honey is healthier than sweetening with sugar), have less impact on environment and they can obtain information about the advantages of honey during the relationship with the producer (Zavodna & Pospisil, 2016).

In summary, Czech honey consumers are origin and price oriented. For buyers, the most critical parameter is the origin of honey (63.15%), followed by the price of honey (18.58%), then the crystallisation of honey (8.20%), the type of honey (6.19%) and finally the organic quality (3.88%). Suppose the buyer cannot taste the honey during the purchase. In that case, these parameters (especially origin and price) become even more critical when buying (Šánová et al., 2017; Zavodna & Pospisil, 2016). To sum up, the origin of honey is a particular factor that plays a role in honey purchasing in the Czech Republic.

Romania, Italy, Serbia

According to the survey by Ionita-Mîndrican et al. (2022) in Romania (n=917), in terms of frequency of honey consumption, 33.6% of respondents said they consumed honey two to three times a week, 26.6% very rarely, 24% only once a week and 13.4% daily, while the proportion of non-honey consumers was 2.4%. 51% of the respondents do not consume other beekeeping products besides honey. Apart from honey, the most consumed bee products were propolis (44.2%) and

royal jelly (29.2%) among the respondents. The most consumed types of honey by Romanian consumers are acacia honey (83.5%), mixed flower honey (81.9%) and linden honey (74.9%). Respondents mainly buy honey directly from the producer (87.1%) and least often from supermarkets (17.8%), organic shops (16.9%) or pharmacies (6.9%). This may be due to a lack of confidence in the quality of the products sold in shops, given that honey is one of the most commonly counterfeited foods. 60% of respondents said they sometimes add honey to breakfast, snacks or soft drinks. Among drinks, honey is most often added to lemonade (84.2%) and tea (74.9%) and much less often to coffee (20.2%). 81.7% of respondents consider honey one of the healthiest sweeteners, and 95.7% trust its medicinal properties. 19.8% of the respondents used honey or bee products often for therapeutic purposes and 62.1% sometimes, mainly to strengthen the immune system and for respiratory diseases, with very few cases of wound healing. The primary sources of information on the beneficial therapeutic properties of honey were the Internet (53.7%), producers (38.6%) and health professionals (37.2%). When buying beekeeping products, Romanian consumers put more emphasis on quality (87.4%) and less on price or special offers. The quality of packaging was also considered, as 62.3% of respondents considered that packaging could affect the quality of beekeeping products, and 77.3% chose beekeeping products packaged in glass jars. Respondents intend to increase the consumption of honey and bee products (Ionita-Mîndrican et al., 2022).

The aim of the study by Ignjatijević et al. (2019) was to determine the factors influencing honey consumption, consumers' purchase intentions and consumer profiles in Romania (n=553), Italy (n=610) and Serbia (n=472). The frequency of honey consumption was similar in all three countries, with honey being the most frequently purchased product every month and every three months. The reasons for consuming honey are also similar, with the majority of respondents using honey that they like it and consider it a healthy food with health benefits. In all three countries, the majority paid between €5 and €10 per kg of honey, with 51.7% of respondents in Serbia, 70.2% in Italy and 69.6% in Romania. There is also a similarity in terms of the place of purchase. In Italy, 45.6% of respondents buy directly from producers and 34.6% buy honey from supermarkets. In Serbia, honey is mainly bought from producers (44.3%) and at markets (35.6%). In Romania, honey is also predominantly bought from producers (79.6%) and at fairs (10.5%). The most significant difference in consumption between the three countries is in terms of packaging. The research results in point to the fact that the strongest tendency of consumers from Serbia was to purchase a package of 1 kg (56.1%); 32% of the respondents bought a 500-g pack, while only 11.9% of the respondents bought a 250-g package. The research results indicated that the highest preference of consumers in Italy is towards purchasing 250-g packages (42.8%); 21% of the respondents buy the 1-kg package, while 36.4% buy a 500-g package. Based on the research results, a typical profile of honey consumers has been drawn up. In Italy, honey consumers are aged 30-49, highly educated, with an average income of €1,000-4,000. The participation of women as honey consumers is more significant due to the need to care for family members. Consumers prefer more miniature packs of honey and unique flavours such as eucalyptus, chestnut, citrus, traditional mixed flower honey and acacia honey. They are used to buying honey from producers. In Romania, honey consumers are 20-30 years old, highly educated, and with incomes of up to €1,000 per month. Women were also in the majority in terms of honey purchases.

Regarding preferences and purchasing habits, Romanian consumers buy honey in larger packages directly from producers, mainly acacia honey and mixed flower honey. Consumers have developed personal relationships with certain producers and buy large packs of honey, mainly mixed flower honey, acacia honey and linden honey. Finally, the research shows

Table 2: Honey consumption and purchasing habits – summary table I.

Aspects	Hungary	Poland	Slovakia	Czech Republic
% of consumer/buyer	<90%	~90%	~90%	77%
Form of consumption	into drinks, direct consumption, on bread, for cakes	in cakes, vegetarian dishes, desserts, with fruit/vegetable, drinks, itself	no data	sweetener
Most commonly consumed type	acacia, mixed flower, linden, rapeseed	multi-flower, linden, honey acacia	acacia	no data
Most important consideration when buying honey	quality, taste, reliability, produced conditions, domestic product	type, method of production, place of purchase	quality, country of origin, taste, type, price	the origin of honey, the price, crystallisation, type, the organic quality
Purchasing honey	producers, farmers' markets, at a gift	marketplace, producers, supermarket	producers, supermarkets, retail stores	producers
Reason for honey consumption	healthy sweetener, medicinal properties, health preservation	medicinal properties, health preservation	for the immune system, medicinal properties, prevent illness, anti-inflammatory properties, taste	bee products are healthy
Price of honey	5,33-8,80 EUR/kg	7-10 EUR/kg	7-10 EUR/kg	4,56 EUR/kg
Packaging	1 kg	1 kg	1 kg	no data
Source of information	Internet, from producers, fairs, farmers' markets	seasonal events, beekeepers, producers	beekeepers, producers	beekeepers, producers

Source: own estimates based on own questionnaire and other publication's data, 2023 (Oravecz - Šedík 2023; Borowska, 2018; Kowalczuk et al., 2023; Hudecová et al., 2021; Šánová et al., 2017; Šedík et al., 2018; Zavodna – Pospisil, 2016)

Table 3: Honey consumption and purchasing habits – summary table II.

Aspects	Romania	Italy	Serbia
% of consumer	<90%	<70%	<90%
Form of consumption	breakfast, snacks, soft drinks, as healthy sweeteners	breakfast, sweetener of herbal teas, coffee or as an ingredient in cakes	sweetener
Most commonly consumed type	acacia, mixed flower, linden	eucalyptus, chestnut, citrus, mixed flower, acacia	acacia, mixed flower, linden
Most important consideration when buying honey	the quality, colour, taste, smell and consistency of the honey		
Purchasing honey	producers	producers, supermarkets	producers
Reason for honey consumption	likes, healthy, therapeutic purposes, strengthen the immune system		
Price of honey	5-10 EUR/kg		
Packaging	1 kg	250 g	1kg
Source of information	Internet, producers, health professionals	producers	producers

Source: own estimates based on Ionita-Mîndrican et al., 2022; Ignjatijević et al., 2018, Ignjatijević et al., 2019, Testa et al., 2019

that education, income and family size are the main factors influencing consumer behaviour (Ignjatijević et al., 2019). Serbian consumers tend to be female, aged 20-39, highly educated, with an average income of €500-2,000.

Research from different countries shows that respondents from all countries prefer to consume honey in their daily diet (in tea, coffee, lemonade, and mixed with seeds) as a restorative and preventive measure. Respondents are aware of alternative uses and familiar with other beekeeping products (pollen, propolis, royal jelly). The most commonly consumed types of honey are acacia honey and mixed flower honey, rapeseed honey, and sunflower honey. However, several respondents also mentioned lesser-known types (e.g. eucalyptus honey, wild honey, citrus honey, chestnut honey). In addition to the taste, the participants in the survey also paid particular attention to the origin of the honey and the producer. They were less concerned about the price, packaging and appearance. Most respondents prefer packaging in kilo or half-kilo packs, except in Italy, where the 250-gram pack is the most consumed. On average, respondents buy honey between €5 and €10. Overall, the results of the questionnaires show that respondents are aware of the positive effects of honey, consider its consumption beneficial from a health point of view and are primarily conscious of their honey consumption habits. When buying honey, the quality, taste, texture, variety, country of origin, producer, price, colour, smell, recommendations from family and friends, and purchase place are essential. In general, we can say that labels, design, advertising, the size and material of the packaging, and organic certification are not essential factors (Table 2 and Table 3).

As has been suggested for other sectors, there is a need for a long-term marketing strategy, an effective information campaign, a well-formulated advertising message, and consumer awareness so that advertising can also serve an educational function (Balogh, 2010). In order to increase honey consumption in Europe, we believe it would be worthwhile to develop a global "honey strategy" focusing on its beneficial physiological effects and promoting its consumption. This could be helped by programmes to promote honey consumption in various forums, by raising awareness of the ecological importance of bees and by reducing the counterfeiting of honey with the direct purchase of quality honey from producers.

Nowadays counterfeit honey is on the rise, so we consider it is very important that customers have the opportunity to buy honey of good quality and from safety environment, and producers can be the most helpful in this.

SUMMARY

Honey is a natural sweetener, and its ingredients have many health benefits. Increasing its consumption is also essential for some reasons, such as supporting the pollination activities of bees or stabilising the income-generating capacity of those involved in the beekeeping sector.

According to surveys in some European countries, the vast majority of people surveyed consume honey. In summary, the European honey consumer uses honey mainly to flavour drinks, cakes, fruit, and seeds, for breakfast, as a healthy sweetener and for direct consumption. It prefers acacia, linden and mixed flower kinds of honey. For a typical European honey consumer, the most important criteria when buying honey are the high quality, the variety and the right conditions under which it is produced. An essential factor for consumers is that the honey they buy comes from local beekeepers. On this basis, European honey consumers buy honey primarily from local beekeepers but sometimes from farmers' markets or supermarkets. Most people consume honey for its health benefits, to boost the immune system, to prevent illness and because they like the taste. The European honey consumer considers a price of €5-10 per kg of honey acceptable and mostly buys honey in 1 kg packages. Information on honey consumption is mainly obtained directly from the beekeeper or via the Internet. To this end, our research looked at how and in what direction honey consumption and purchasing habits have changed, comparing them with previous international and national surveys. Overall, honey consumption is steadily increasing in the countries surveyed. The percentage of people who do not consume honey at all can be low in all countries. In the case of each survey, more than half of the respondents buy honey directly from the producer. More than half of the respondents consider honey's health benefits and the importance of quality and pleasant taste. Non-price factors are, therefore, more important in purchasing and selection, similar to some countries in the region.

The results confirm that honey consumption has increased in recent years and that the respondents are becoming more conscious of their honey consumption and purchases. Some

former misconceptions seem to have been challenged, but some remain (e.g. crystallisation). It is also important to note that our survey suggests that honey consumption should be promoted more widely and firmly in the future. Honey is a product of trust; the origin and source are essential, and it would be worthwhile to strengthen this to consumers as much as possible. For European honey consumers, it is crucial to have access to high-quality honey, as this is one of the most important considerations when buying honey.

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ONLINE AND E-LEARNING BEST PRACTICES, NEEDS AND HABITS FOR THE INTERNATIONAL AGRIMBA NETWORK

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Abstract: *From the literature part of this research, it shows that, some of the most popular Learning Management Systems (LMS), such as Moodle, Canvas and Blackboard, are used by many universities and colleges worldwide and their popularity is steadily increasing as more institutions adopt online learning. The usage statistics of LMSs by universities can be influenced by a number of factors, such as the size of the university, the specific requirements of the institution, the availability of alternative solutions, and the preferences of faculty and students. In addition, the popularity of LMSs among universities may change over time as new systems enter the market or as existing systems improve and evolve. Based on the number of customers, Moodle's three biggest competitors in the learning management systems category are Google Classroom with 11.70%, LinkedIn Learning with 8.87% and TalentLMS with 5.16% market share. The most frequently used functionalities of the e-learning system are: study content creation, course management and content library, and the least frequently used are integration with other systems, multilanguage utility, plagiarism checking, accessibility to people with disabilities and personalized learning. Similarly, the most popular functionalities are course management, study content creation and assessment and testing. Respondents least liked the functions of integration with other systems, webinars, accessibility for inclusion, and video hosting and streaming. Lectures or slides are most often uploaded to platforms, followed by written materials and links, then videos, pictures and tables. Judging by the answers received, the majority of respondents are either completely satisfied (34%) or moderately satisfied (42%) with the e-learning systems they are using now.*

INTRODUCTION ON LEARNING MANAGEMENT SYSTEMS

ABOUT LMS IN GENERAL

A Learning Management System (LMS) is a software platform that manages courses, training programmes and assessments. LMSs provide an online space where trainers and learners can interact, collaborate and access learning materials (Bradley, 2021).

Some key features of LMSs are (David, 2022; Ippakayala, 2017 and Nurassyl, 2020):

- Course management: LMSs allow instructors to create, manage and organise content, including multimedia materials, tests, assignments and assessments.
- Tracking learners: LMSs can track learners' progress and generate reports on their activities and performance.
- Collaboration and communication: LMSs provide tools for learners to communicate and collaborate with each other and with the instructor, such as forums, messaging and wikis.
- Assessment and testing.
- LMSs can be used in a variety of settings, including education, corporate training and other training. They can be cloud-based or deployed on-premises, and some are open source, meaning that the code can be accessed, modified and distributed by anyone.
- In addition to the basic functions outlined above, modern LMSs often offer a range of advanced features that support the delivery of engaging and effective learning experiences. Some of these features include:
- Gamification: LMSs can use gamification techniques such as points, badges and leaderboards to motivate learners and make learning more enjoyable.
- Adaptive learning: some LMSs offer adaptive learning features that allow the system to modify the learning experience according to the learner's individual needs and progress.
- Mobile learning: Many LMSs are optimised for mobile devices, allowing learners to access learning materials and assignments on the go.
- Collaborative learning: LMSs can facilitate collaborative learning by providing learners with opportunities to interact and collaborate with peers, tutors and other experts in their field.
- Integration: LMSs can be integrated with other systems and tools such as HR systems, e-commerce platforms and student information systems to streamline workflows and improve data management.

- LMSs have become increasingly important with the growing demand for online and distance learning. They provide a convenient and flexible way for learners to access educational content and support their learning journey, while also providing instructors with tools to manage and track learner progress. For long-term sustainability, it is essential to use an LMS that meets the specific needs of the organisation, taking into account factors such as cost, functionality and ease of use.

TOP 20 POPULAR LEARNING MANAGEMENT SYSTEMS (LMSS)

Today there are many LMS systems available. Many aspects can influence which one becomes popular or not. Statistics show that the following 20 LMS systems are the most popular (elearningindustry.com, 2023; Bouchrika, 2023): Moodle, Blackboard, Canvas, Schoology, TalentLMS, D2L BrightSpace, Instructure Canvas, Adobe Captivate Prime, Edmodo, Google Classroom, Talentsoft, Absorb LMS, Docebo, LearnUpon, Saba Software, SAP Litmos, Edsby, Talentedge, Thinkific, LatitudeLearning.

The list is not exhaustive and there are many other LMSs available, each with their own strengths and weaknesses. When choosing an LMS, it is important to consider specific needs and requirements, advanced features, ease of use, scalability, cost and customer support.

CONSIDERATIONS FOR COMPARING THE LMS

LICENCE TYPE			
Free LMS		Commercial LMS	
SOURCE CODE AVAILABILITY			
Open source LMS		Proprietary LMS	
LICENSING MODELS			
Per number of registered users	Per number of connected users	Per license validity period	Per number of courses
INSTALLATION TYPE			
Hosted (Software as a Service)		Own	
BUSINESS ORIENTATION			
eCommerce	Educational institutions	Corporate training	Government structures
ELEARNING STANDARDS COMPLIANCE			
International Standard (SCORM, AICC, IMS)	Local standards	No standards	
CONTENT CREATION POSSIBILITIES			
Integrated tools for courses creation	Separate tools for courses creation	Possibility to use reusable content only	
INTEGRATION POSSIBILITIES			
Open source	Documented API (SDK)	Integration via bridges	

source: Ouadoud et. al., 2017.

Some of the most popular open-source LMSs:

- Moodle
- ILIAS
- ATutor
- Chamilo
- OpenEdX
- Canvas LMS (offers a free version for K-12 schools)
- Schoology (offers a free version for K-12 schools)
- Google Classroom (free for personal use)
- Classcraft (free for teachers)

Available Own server hosted Learning Management Systems (LMS)

There are both commercial and open-source options available.

Commercial:

- Blackboard Learn
- Canvas LMS
- Schoology
- Brightspace by D2L
- Instructure

Open-Source:

- Moodle
- ILIAS
- ATutor
- Chamilo
- OpenEdX

When selecting a self-hosted LMS, it is important to consider factors such as the technical expertise required for installation and maintenance, the cost of hardware and software, the level of support provided by the vendor or open source community and the level of security available.

Cloud-based LMSs

The most popular free LMSs:

- Moodle
- ILIAS
- Canvas LMS
- Open edX

Commercial LMSs that can be hosted on the cloud include:

- Blackboard
- D2L (Desire2Learn)
- Schoology
- TalentLMS

Some LMSs may be free to use but there may be additional costs for hosting, customization, and support. Additionally, free LMSs may have limited features and support compared to commercial ones.

GROUPING POSSIBILITIES

LMSs can be grouped into several categories based on their features, capabilities, and intended use cases. Some common categories include (Faith, 2022):

- Open-Source LMSs: LMSs that are freely available and can be modified and customized as needed. Examples include Moodle and ILIAS.
- Commercial LMSs: LMSs that are purchased and supported by a vendor. Examples include Adobe Captivate Prime and Docebo.
- Cloud-Based LMSs: LMSs that are hosted and maintained by the vendor, with users accessing the platform through a web browser. Examples include TalentLMS and Absorb LMS.
- Enterprise LMSs: LMSs designed for large organizations, often with advanced features and customization options. Examples include SAP Litmos and Cornerstone OnDemand.
- Small Business LMSs: LMSs designed for smaller organizations and businesses, with simplified interfaces and streamlined features. Examples include Thinkific and LearnWorlds.
- Niche LMSs: LMSs designed for specific industries, such as healthcare or education, or for specific types of training, such as safety or compliance training. Examples include Edmentum and Workday Learning.

AVAILABLE MODULES ON LMS SYSTEMS

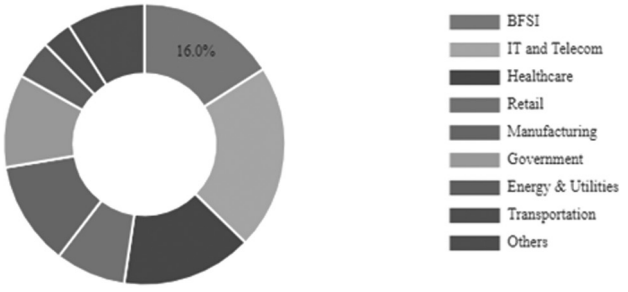
1. Course management and content creation: This module allows for the creation and management of courses, including the addition of content, activities, and assessments.
2. User management and enrolment: This module manages the registration, enrolment, and tracking of users, including role management and access controls.
3. Assessment and testing: This module provides the ability to create and administer quizzes, exams, and other assessments to measure learning and understanding.
4. Reporting and analytics: This module generates reports and provides data and insights on learner activity and performance, course completion rates, and more.
5. Gamification and rewards: This module incorporates game-like elements and rewards to encourage learner engagement and motivation.
6. Communication and collaboration tools: This module includes features such as forums, chat, and messaging to facilitate communication and collaboration among learners and instructors.
7. Social learning: This module enables learners to interact with one another, share knowledge and experiences, and form communities.
8. Content library: This module provides a centralized repository for storing and sharing learning resources and materials.
9. Virtual classrooms and webinars: This module provides live, interactive, and remote learning experiences through virtual classrooms and webinars.
10. Mobile learning: This module enables learners to access learning resources and participate in courses using mobile devices.
11. eCommerce and billing: This module allows for the sale and purchase of courses and other learning products, along with the management of payments and billing.
12. SCORM and xAPI compatibility: This module enables compatibility with widely-used e-learning standards, such as SCORM and xAPI, to support the use of existing learning resources and content.
13. Compliance and certification tracking: This module tracks compliance and certification requirements and generates reports and certificates as needed.
14. Multi-language support: This module provides support for multiple languages, allowing for the creation and delivery of courses in different languages.
15. Integration with other tools and systems: This module enables integration with other systems, such as HR and ERP systems, to streamline data and workflows.
16. Custom branding and styling: This module provides customization options for branding, style, and overall look and feel.
17. Virtual reality and augmented reality: This module incorporates virtual and augmented reality technologies to provide immersive and interactive learning experiences.
18. Personalized learning and adaptive courses: This module provides customized and adaptive learning experiences based on individual learner needs and preferences.
19. Accessibility and inclusive design: This module is designed to be accessible to learners with disabilities and to comply with accessibility standards.
20. Blended learning and flipped classroom: This module supports blended learning and flipped classroom approaches, combining traditional and online learning methods.
21. Micro-learning and bite-sized content: This module provides short, focused, and easily-digestible learning experiences.
22. Compliance reporting and data privacy: This module ensures compliance with data privacy regulations and generates reports on data use and protection.
23. Video hosting and streaming: This module provides hosting and streaming capabilities for videos and other multimedia content.
24. Automated email and notifications: This module generates automated email and notifications to learners, instructors, and administrators.
25. User engagement and interaction tracking: This module tracks and measures user engagement and interaction with course content and activities.

USAGE STATISTICS OF THE LMSS

Usage statistics are influenced by a number of factors, it is important to consider the following needs in the selection process (Bouchrika, 2023). Ease of use: the best LMS platforms are easy to use and require little or no training. They should be intuitive and user-friendly. Features: The best LMS platforms offer a robust feature set that meets the needs of both businesses and learners. Customer support: Some LMS platforms offer customer support so you can get help when you need it. Pricing: the best LMS platforms are affordable and offer a range of pricing options to suit your budget. Scalability: the best LMS platforms are scalable, so you can grow your learning program as your needs change. Usage statistics can vary widely and are difficult to compare directly, as different universities may use different LMSs. Some of the most popular LMSs, such as Moodle, Canvas and Blackboard, are used by many universities and colleges worldwide and their popularity is steadily increasing as more institutions adopt online learning (Bouchrika, 2023).

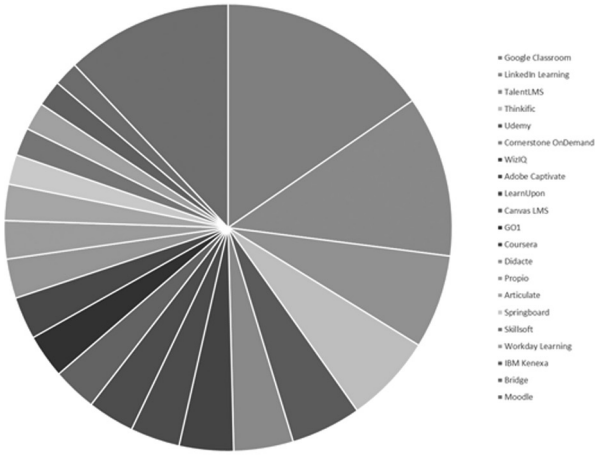
As can be seen from the figure below, the use of LMS systems is present in all sectors and the continued growth in the size of the LMS market also indicates that it is increasing fast.

Figure 1.1.: Global learning Management System Market Share by industry



Source: Fortune Business Insights (2023)

Figure 1.2.: Market Shares of the different LMSs



Source: 6sense (2023)

The usage statistics of LMSs by universities can be influenced by a number of factors, such as the size of the university, the specific requirements of the institution, the availability of alternative solutions, and the preferences of faculty and students. In addition, the popularity of LMSs among universities may change over time as new systems enter the market or as existing systems improve and evolve.

As can be seen from the figure below, based on the number of customers, Moodle's three biggest competitors in the learning management systems category are Google Classroom with 11.70%, LinkedIn Learning with 8.87% and TalentLMS with 5.16% market share.

STRONG AND WEAK POINTS OF 5 POPULAR LMSS

MOODLE

Moodle is a popular and widely used open-source learning management system (LMS) (Faith, 2022; Rajagukguk, 2020; Al-Ajlan-Zedan, 2008; Abdalllah, 2022; Mpungose, 2022; Moodle, 2023)

Strong Points:

- Customizability: Moodle allows for a great deal of customization, from the appearance of the platform to the features and functionalities it offers.
- User-friendly interface: Moodle has a user-friendly interface that is easy for students, teachers, and administrators to use.
- Open-source software: Moodle is open-source software, which means that it is free to download and use, and users have access to the source code. This also means that users can contribute to the development of the platform.
- Large community: Moodle has a large and active community of users, which means that users can access support and resources, and share knowledge and experiences.
- Wide range of features: Moodle offers a wide range of features, including course management, student tracking, assessment, collaboration tools, and more.

Weak points:

- Complexity: Moodle can be complex to set up and use, especially for those who are not familiar with the platform or with technology in general.
- Limited reporting capabilities: Moodle's reporting capabilities are limited compared to other LMSs.
- Customization can be difficult: Although Moodle allows for a great deal of customization, making those changes can be difficult for those who are not familiar with programming.
- Performance issues: Moodle can experience performance issues, particularly when used by a large number of users or when used for large courses with many resources and activities.
- Lack of integrated mobile app: Moodle does not have an integrated mobile app, which means that users have to access the platform through a mobile browser.

Blackboard

Blackboard is a popular commercial LMS used by many universities and institutions (Abdalllah, 2022; Mpungose, 2022; Blackboard, 2023).

Strong Points:
- Customization: Blackboard provides a range of customization options that allow institutions to tailor the platform to their specific needs.
- User-Friendly Interface: Blackboard has a user-friendly interface that makes it easy for teachers and students to navigate and use the platform.
- Mobile Support: Blackboard provides a mobile app that allows students to access course content and participate in discussions from their smartphones.
- Integration: Blackboard integrates with a range of other tools and platforms, including social media, e-portfolios, and e-textbooks.

Weak points:
- Cost: Blackboard is a commercial LMS and can be expensive, especially for institutions with limited budgets.
- Technical Support: Some users have reported issues with Blackboard's technical support and service, which can be slow to respond and resolve issues.
- Complexity: Some users find Blackboard to be complex and difficult to use, particularly those who are not familiar with LMS platforms.
- Limited Customization: While Blackboard provides some customization options, some users feel that the customization options are limited compared to other LMS platforms.

Canvas

Canvas LMS is a cloud-based learning management system that provides a wide range of features and tools for creating, delivering and managing online courses (Mpungose, 2022; Canvas, 2023).

Strong points:
- Easy-to-use user interface that makes it simple for instructors and students to navigate
- Customizable course pages and modules for a personalized experience
- Robust analytics and reporting features to track student progress and engagement
- Integration with a wide range of third-party tools and apps
- Mobile app for easy access to course materials from any device
- Extensive support and training resources to help users get the most out of the platform

Weak Points:
- Can be difficult to use for those who are not familiar with online learning platforms
- Some features and tools are not as intuitive as they could be
- Some users have reported difficulties with the platform's speed and performance
- Some reports of technical support response times being slower than desired.

Google Classroom

Google Classroom is a free web-based LMS developed by Google (Husain, 2023).

Strong points:
- User-friendly interface and easy to use
- Integration with other Google products such as Gmail and Google Drive
- Accessibility from any device with internet access
- Real-time collaboration and communication features
- Automated grading and organization of assignments

Weak points:
1. Limited customization options
2. Limited reporting and analytics capabilities
3. Limited ability to manage larger courses with multiple sections and instructors
4. No integration with third-party tools and resources
5. Limited functionality for creating and managing exams and assessments.

ILIAS

ILIAS is an open-source learning management system (LMS) that is designed for educational institutions and businesses (Ilias, 2023).

Strong points:
- Open-source: ILIAS is free to use and can be customized to meet specific needs.
- Flexibility: ILIAS is highly customizable, allowing users to adapt it to their specific needs and requirements.
- User-friendly: ILIAS has a user-friendly interface, making it easy for both students and teachers to use.
- Collaboration: ILIAS provides a range of tools for collaboration, including forums, wikis, and chat rooms.
- Accessibility: ILIAS is accessible and can be used on a range of devices, including computers, tablets, and smartphones.

Weak points:
- Complexity: ILIAS can be complex and challenging to use, especially for those who are not tech-savvy.
- Lack of support: As an open-source platform, ILIAS has limited support, which may make it challenging for users to resolve issues.
- Limited resources: There may be limited resources available for ILIAS, making it difficult for users to find help when they need it.
- Integration: Integrating ILIAS with other systems can be challenging, which may limit its effectiveness for some users.
- Customization: Customizing ILIAS can be time-consuming, especially for those without technical expertise.

MATERIAL AND METHODS

The research began with a review of cutting-edge resources and best practices implemented in e-learning systems at leading universities in Europe. This was based on the desk-research and online experts meetings for discussion of particular solutions. The second step was taken to investigate the needs of users and the types of software functionalities, which AgriMBA network institutions and students expect from such a Pan-European Learning system. For this task, a broad survey was conducted on users' preferences towards different features and options of e-learning systems. An intentional sample was used for the survey, consisting mainly of lecturers from the AGRIMBA network who use e-learning platforms. The invitation to participate was sent by e-mail to at least 10 addresses at each university that is a member of AGRIMBA.

RESULTS OF THE ONLINE QUESTIONNAIRE ON THE USES OF UNIVERSITY E-LEARNING PLATFORMS

A total of 71 people from 18 universities participated in the online survey. Most participants were from the Czech University of Life Sciences (22.54%), the Slovak University of Agriculture (16.90%) and the University of Debrecen and Technical University of Moldova (14,08%) (Figure 3.1).

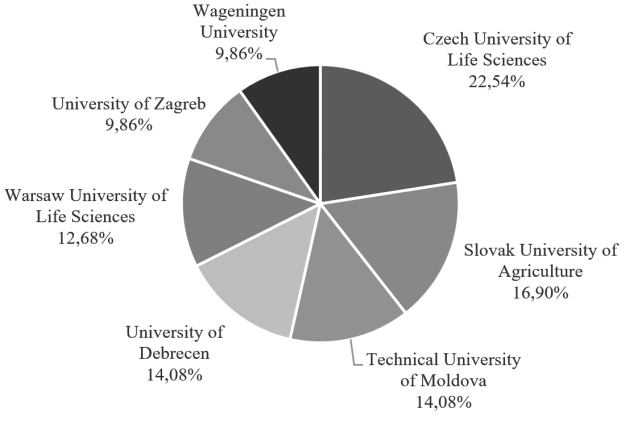
The largest number of respondents is in the 40-49 age group (34 out of 71). The number of younger people from this group (18) is almost the same as the number of older than 50 years people (19). This is due to the employment structure at the universities. (Figure 3.2).

When it comes to the professional sphere, as many as 28 respondents (39%) represent the field of Economics of food supply chains. This is followed by the field of management with 16 participants, followed by Business Planning with 5 participants. Three respondents represent the fields of marketing and economics, while there were one or two respondents in the other fields (Figure 3.3).

The most frequently used e-learning platform among respondents is the Moodle platform, which is used by 78% of respondents. Brightspace, MS Teams, Google Classroom and Blackboard are used somewhat more among other platforms, or different e-learning tools are combined (Figure 3.4).

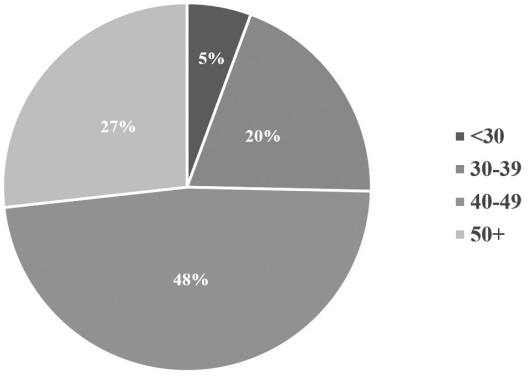
Respondents are of the opinion that there is sufficient interest in the use of e-learning systems at their universities (63%). Their use has certainly increased during the period of the COVID-19 pandemic. However, 35% of the respondents believe that this interest is not sufficient considering the possibilities and needs (Figure 3.5).

Figure 3.1. Structure of participants according to institution they represent



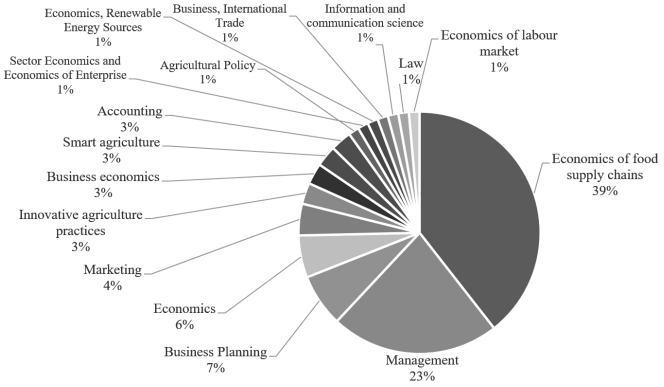
Source: own study

Figure 3.2. Age structure of respondents



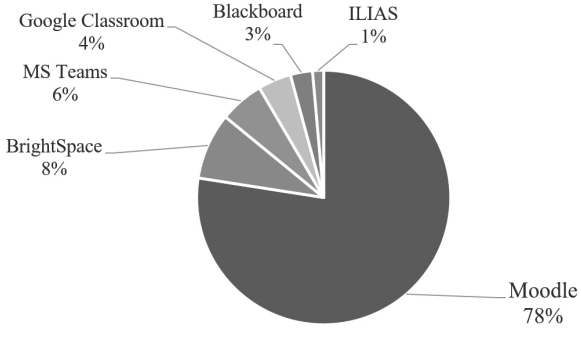
Source: own study

Figure 3.3. Field of expertise of respondents



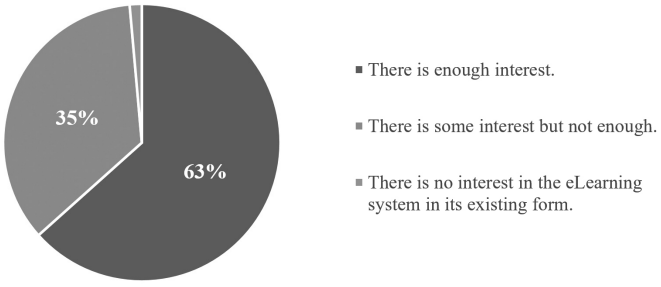
Source: own study

Figure 3.4. Name of the eLearning platform what the respondents use on their University



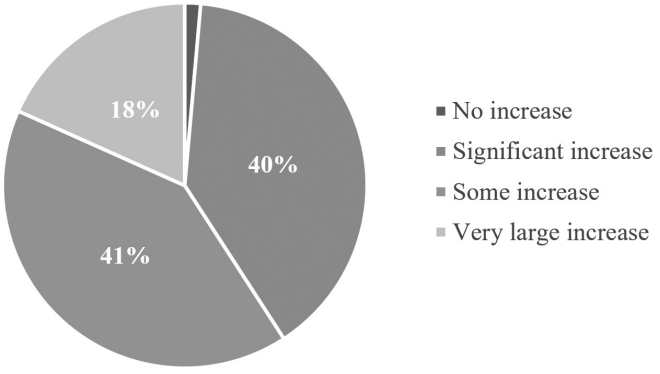
Source: own study

Figure 3.5. Interest in the eLearning system at the Universities in the existing form



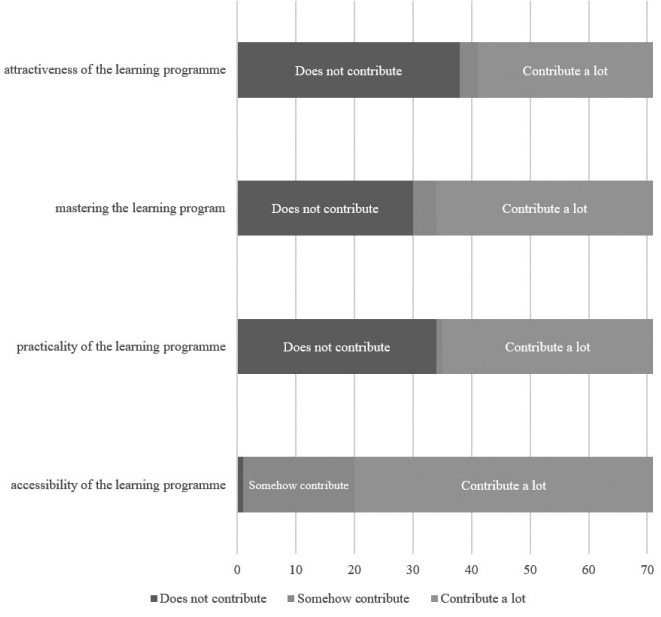
Source: own study

Figure 3.6. Are e-Learning system increases teaching or learning programme attractiveness?



Source: own study

Figure 3.7. How do you think the e-Learning platform contributes to the…



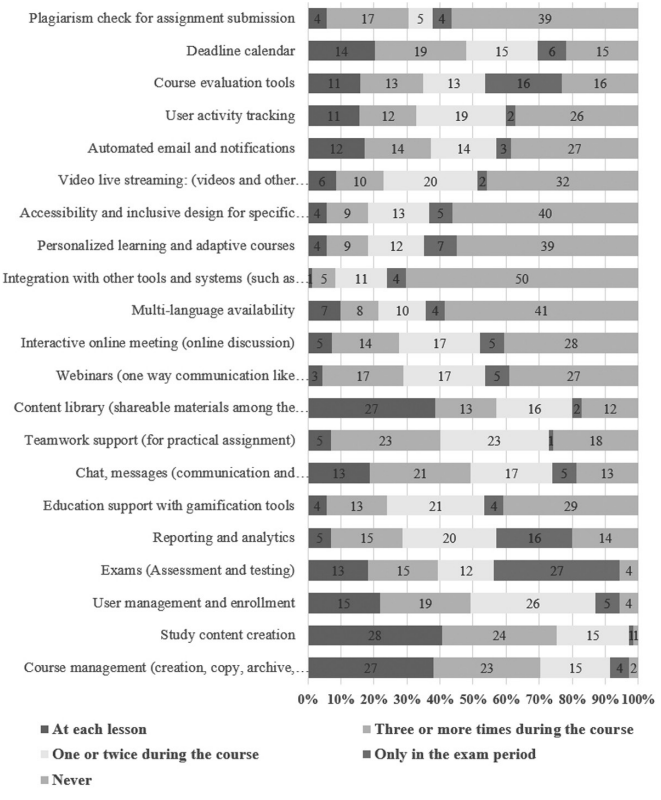
Source: own study

One of the reasons for the expansion of the use of e-learning systems can be found in the answers to the question about the impact of their use on the attractiveness of the curriculum. Namely, 58% of respondents believe that teaching with the help of e-learning systems significantly or very strongly increases the attractiveness of the teaching or learning program. On the other hand, only one answer is that online technology does not increase the attractiveness of the program (Figure 3.6).

According to the results of this survey, online platforms contribute the most to the availability of teaching programs and materials. The contribution to the attractiveness of the program was rated somewhat lower, followed by the contribution to practicality and the contribution to mastering the learning program (Figure 3.7).

In order to better assess how much and in what way e-learning systems are used, we asked survey participants to select how often they use a particular function or tool in the teaching period on a scale from 1 = For every lesson to 5 = Never. Of the 21 functionalities offered, respondents most often chose use functions: study content creation, course management and content library. On the other hand, most respondents never use functions: integration with other systems, multilanguage utility, plagiarism checking, accessibility to people with disabilities and personalized learning. Among the other functionalities, the following are mentioned as relatively frequently used functions: user management, calendar, knowledge assessment, chat and messaging, automated emailing, course evaluation tools, and user activity tracking (Figure 3.8).

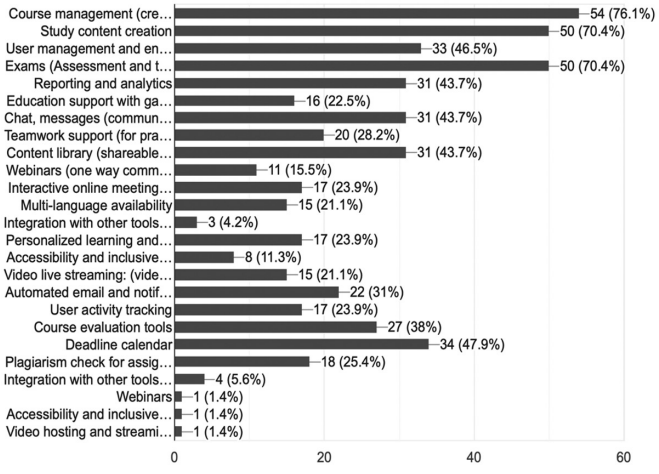
Figure 3.8. How often do you USE certain function of the e-Learning system at an average course?



Source: own study

According to the number of times they have been chosen (f), the most likable function of the learning platform is related to the course management (76% of respondents) (Figure 3.9). The study content creation and assessment and testing functions were mentioned almost equally many times (each 70%). The following are functions with more than 30 mentions: deadline calendar, reporting and analytics, chat and messaging, and content library. The least mentioned as preferred functions mainly correspond to those which are also most rarely used, namely: integration with other systems, webinars, accessibility for inclusion, video hosting and streaming.

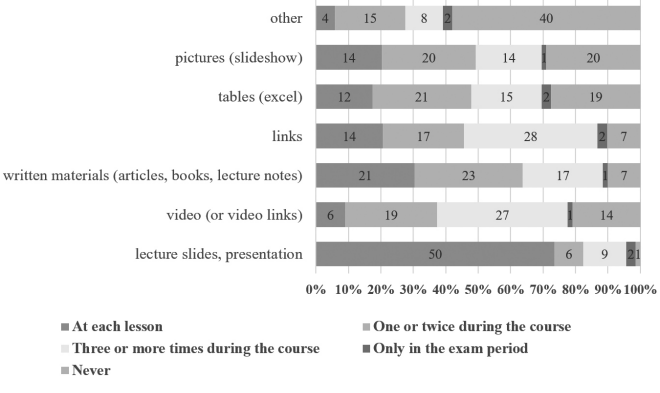
Figure 3.9. E-learning function popularity among respondents



Source: own study

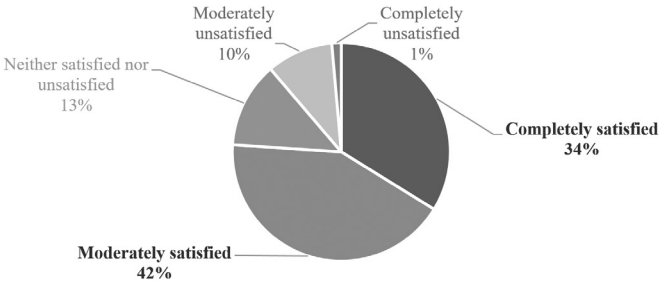
Placing materials on the e-learning platform and making them available to students is one of the main functions of the system. For this reason, we asked respondents to give us information on how often they upload these materials during the semester. The answers offered were: "at each lesson", "3 or more times during the course", "1-2 times during the course, only in the exam period", and "never". The most common is the upload of lectures or slides, and most of them at each lesson (Figure 3.10). Written materials and links are often uploaded, followed by videos, pictures and tables, which, however, many respondents never upload.

Figure 3.10. E-learning upload material habits



Source: own study

Figure 3.11. Satisfaction with the e-learning platform that respondents use at their university



Source: own study

At the end of the survey, the respondents expressed their satisfaction with the e-learning system they are currently using. We measured satisfaction on a scale from 'Completely unsatisfied' to 'Completely satisfied'. Only 1 respondent chose the answer completely unsatisfied, and 10% moderately unsatisfied (Figure 3.11). Out of 71 respondents, 42% of them are moderately satisfied with the existing system, and 34% are completely satisfied, while 13% of them chose a neutral attitude. Despite the relative majority of moderately satisfied and completely satisfied respondents, we still see that there is room for improving the system, which should be taken into account when creating an e-learning system for AGRIMBA.

SUMMARY- RECOMMENDATIONS FOR THE DESIGN OF THE IDEAL E-LEARNING SYSTEM

From our questionnaire on "the uses of university e-learning platforms", in total 71 people from eight universities participated in the survey conducted online under the title the Online Questionnaire on the Uses of University E-learning Platforms. Most of the respondents were university teachers with experience in using e-learning systems from various fields of economics, business management and marketing. Currently, Moodle is the most common e-learning system at respondents' institutions, but there are also examples of using other systems as well as combining different systems to improve functionality.

Most of the respondents agree that the interest in the e-learning system is high enough, although there is also a part of them who believe that it could be even greater. E-learning systems are popular because they contribute to the popularity of teaching or learning programs and enable easier administration and greater availability of them.

The most frequently used functionalities of the e-learning system are: study content creation, course management and content library, and the least frequently used are integration with other systems, multilanguage utility, plagiarism checking, accessibility to people with disabilities and personalized learning. Similarly, the most popular functionalities are course management, study content creation and assessment and testing. Respondents least liked the functions of integration with other systems, webinars, accessibility for inclusion, and video hosting and streaming.

Lectures or slides are most often uploaded to platforms, followed by written materials and links, then videos, pictures and tables. Judging by the answers received, the majority of respondents are either completely satisfied (34%) or moderately satisfied (42%) with the e-learning systems they are using now.

Moodle is a popular and widely used open-source learning management system (LMS).

Strong Points:

- Customizability: Moodle allows for a great deal of customization, from the appearance of the platform to the features and functionalities it offers.
- User-friendly interface: Moodle has a user-friendly interface that is easy for students, teachers, and administrators to use.
- Open-source software: Moodle is open-source software, which means that it is free to download and use, and users have access to the source code. This also means that users can contribute to the development of the platform.
- Large community: Moodle has a large and active community of users, which means that users can access support and resources, and share knowledge and experiences.
- Wide range of features: Moodle offers a wide range of features, including course management, student tracking, assessment, collaboration tools, and more.

Weak points:

- Complexity: Moodle can be complex to set up and use, especially for those who are not familiar with the platform or with technology in general.
- Limited reporting capabilities: Moodle's reporting capabilities are limited compared to other LMSs.
- Customization can be difficult: Although Moodle allows for a great deal of customization, making those changes can be difficult for those who are not familiar with programming.
- Performance issues: Moodle can experience performance issues, particularly when used by a large number of users or when used for large courses with many resources and activities.
- Lack of integrated mobile app: Moodle does not have an integrated mobile app, which means that users have to access the platform through a mobile browser.

Based on all of the above and the expressed level of satisfaction, we can conclude and recommend that the e-learning system and design that is currently most often used represents (MOODLE based system) a very good base for the development of a quality system for AGRIMBA.

Final summary about how to handle the weak poins of moodle in this research:

- Complexity issue: We will install only the necessary apps we need and we will simplify the their management.
- Limited reporting capabilities: It is more than enough for this organization size.
- Customization can be difficult: We have enough experience to do the necessary customisation and demands to change the themes and other customizations won't come up so frequently.
- Performance issues: This system will be used approximately 50-60 users parallel, and we have a brand-new server with very good internet connection. These issues come up only at extra loading
- Lack of integrated mobile app: We don't need mobile app.

To summarize the above list of weaknesses the answer is that we can handle them and they will not have any bad impact on the developing project.

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ARTIFICIAL INTELLIGENCE IN THE CORPORATE SECTOR

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Abstract: *Humanity has made huge progress over the past millennia. We are working with technologies, robots that not only help us to work accurately, efficiently and quickly, but they work in a similar way to the human brain: they perceive, think, learn and solve problems. In my research, I will focus on artificial intelligence, which is becoming more and more popular nowadays, looking at its past, present and future, its main trends in the corporate sector, and how it threatens people's job opportunities. At the same time, one of my research objectives is to investigate how much the development of a country is related to the uptake of AI in the European Union, which I will test with correlation analysis, taking into account indicators of artificial intelligence penetration in the corporate sector from one side and the various AI indicators such as digital penetration, internet usage, computer culture, and economic indicators as GDP per capita from the other side.*

Keywords: *artificial intelligence, enterprise, development, relation, European Union*

INTRODUCTION

Since the creation of mankind, a continuous evolution can be traced. As a result of the curiosity and perseverance that came from basic human nature, our ancestors created a wealth of inventions without which it would be unthinkable to exist in our world today.

While in the first industrial revolution, in the 18th century, mechanical devices improved human productivity, in the second industrial revolution, greater emphasis was placed on electricity and assembly line production, which increased production efficiency; speeding up the work process and reducing costs. The most important discipline of the previous century, and of the third industrial revolution, was computer science, with the great invention of the computer, which automated many activities, while at the same time allowing long-term storage of information. (Senthil & al., 2020)

Today, we are in the era of the fourth industrial revolution (Industry 4.0), which focuses mainly on areas that replace monotonous human labour or work that is harmful to humans. (Nagy & Hajdu, 2021) This era is mainly based on robotics, the rapid processing of large and varied data sets (Big Data), 3D technologies and the growing use of artificial intelligence, whose application will become increasingly important in the coming years, creating a growing gap between producer and consumer countries. (Savas, 2021)

What is artificial intelligence? Jean Paul Simon described it as "the umbrella term for the science of making machines smart". (Simon, 2019) The National Council for Science and Technology report suggests that it is not possible to define artificial intelligence in general terms, due to the different perspectives of experts, which are often contradictory, but it is generally accepted that it is a system based on 4 principles that also characterise human intelligence: learning, reasoning/thinking, problem solving and perception. In fact, these machines solve tasks using algorithms that also involve human intelligence. (Simon, 2019) At the same time, machine learning allows you to learn and grow through experience, data and examples. (Jumani, Laghari, Narwani, & David, 2021)

Henrietta Czibor defines artificial intelligence as a complex system capable of interpreting, synthesizing and processing "human knowledge encoded in different ways (text, numbers, images, sound, video, etc.)". Artificial intelligence is expected to be the technology that will define the new technical-economic paradigm, as it is increasingly embedded in everyday life; it is being used in a growing number of sectors; it will accelerate the development of different disciplines; it will boost the efficiency of activities, whether at the level of process, organisation, enterprise or marketing innovation; it can create industries that could not be created by other systems, while at the same time it can eliminate or transform existing industries and activities. (Czibor, 2020)

The secret to AI's success in the enterprise is in benefits such as: saving money by automating routine, repetitive processes, reducing operational costs and human burden, increasing revenue, predicting customer preferences and providing a more personalised experience, gaining a competitive edge in the marketplace, performing faster work with more deliberate, informed decision-making, personalising learning and improving accuracy. (Sadiku, Fagbohungbe, & Musa, 2020)

Huang, Rust, and Maksimovic argued that in the future, humans will mainly be assigned to tasks dealing with emotions, as robots and machines can still be used to perform mechanical tasks, while AI will be assigned to thinking tasks, in which they process, analyse and interpret data, leaving humans to perform jobs that cannot be left to robots and technology. (Huang, Rust, & Maksimovic, 2019)

According to the World Economic Forum's 2020 ranking, the five most important workforce skills are analytical thinking and innovation, active learning and learning strategies, complex problem solving, critical thinking and analysis, and creativity, individuality and initiative. Overall, therefore, there is no risk of automation in occupations where creativity and aesthetic value, empathy, manual dexterity or artistic inclination are important. (Nagy & Hajdu, 2021)

In recent years, many have questioned the extent to which jobs will be automated and which areas will be most affected by the digital revolution of our time. Frey and Osborne found that about 47% of the 702 occupations they studied would be at high risk of automation in the United States in the next decade or two. (Frey & Osborne, 2013).

According to another article published in the United States, 73 million people in the country could lose their jobs due to artificial intelligence by 2030, but it further emphasised that although many jobs could be affected, only humans will be able to perform the fundamental tasks, so workers should strive to improve their skills to perform their tasks more efficiently, thus contributing to economic growth. (Jumani, Laghari, Narwani, & David, 2021)

In all of the studies mentioned above, there was a consensus that tasks requiring cognitive skills, creativity and human sensitivity are the most difficult to machine. Furthermore, US data have also shown that wages and educational attainment are negatively correlated with the computerisation of occupations, which means that jobs with lower wages or lower educational attainment are more likely to be computerised. (Reisinger, Reisinger, & Nagy, 2022)

At the same time, there is a growing trend, thanks to artificial intelligence, for a smaller workforce to be needed in the coming years for jobs that require thinking, even in the medical or legal sectors. One of the key issues of the coming decades is likely to be how to deal with the mass unemployment that will result from such a continuous transition. A potential solution, according to some, could be to make less use of these systems and technologies, or using the money saved by automation to provide training opportunities for workers to learn new skills that cannot be automated, that machines will not be able to do for them, but another option is to employ people for fewer hours so that the workload can be better distributed. (Haenlein & Kaplan, 2019)

DATA, METHODOLOGY

The main research questions I was looking for answers to were:

- Is there a correlation between the spread of artificial intelligence and development measured by different economic and IT indicators in different countries?
- Where, in which European Union countries, has the most AI been implemented for certain jobs in different sizes of companies?

The data used in the research were mostly downloaded from the Eurostat statistical database, than processed and analysed; the data are focused on the countries of the European Union. I think it is important to mention that this is an area that has gained importance in recent years, and is a recent research area in terms of the indicators and concepts under study, and because of this in many cases the only year in which data were available was 2021.

In terms of the structure of the research, the literature review aims to provide an overview of the concept of artificial intelligence and the industrial revolution of which it is a part, providing information on developments and trends in recent decades, and also highlighting potential future problems it may cause.

After processing the obtained information, statistical methods were used to make calculations, measurements and comparisons between the data, followed by a linear regression test and a two-sided T-test to find the relationship between the different factors, in order to prove the existence of a relationship between two variables (one explanatory and one explained).

The research was divided into two parts: first, I looked for a correlation between indicators of artificial intelligence penetration in the corporate and GDP, purchasing power parity, Human Development Index, internet accessibility, digital intensity and the use of computers in companies by size of enterprises in the European Union countries.

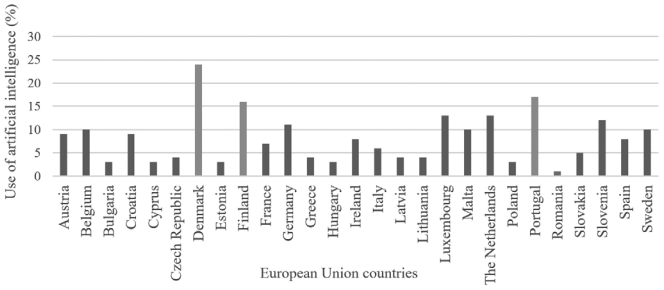
In the second half of the research, I examined the measure in the selected countries of using AI technology in their work in six specific areas (marketing, production, organisation/administration, logistics, IT security, and human resource management/recruitment). As in the first part, in this case too, I divided the aggregated results by company size, attempting to examine which areas use AI the most and least, by establishing average values. At the same time, I also want to look at which countries are leading the way, which are best able to incorporate the most rapidly developing technology of our century into their work processes. I will conclude by evaluating the results.

RESEARCH RESULTS

Data used

As I mentioned earlier, I used various economic and IT indicators to investigate whether there is a correlation with the spread of artificial intelligence in the European Union countries. To do this, I looked at the percentage of countries using at least one AI technology in their work processes in the year of 2021, for companies of any size. This aggregation is illustrated in the following graph:

Figure 1: Use of artificial intelligence in the European Union countries in 2021

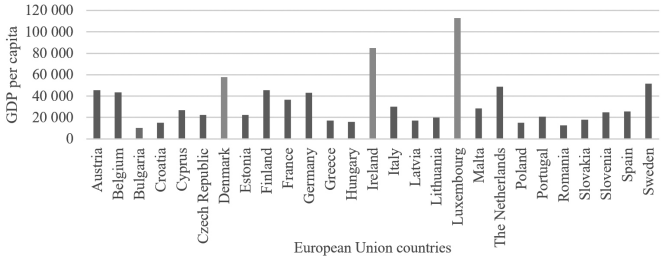


Source: own editing, based on Eurostat

The figure shows that Denmark has a high rate of adoption of AI technologies in most companies. The second highest is in Portugal, while Finland is in third place. The lowest level of any use of AI in the operation of companies is in Romania.

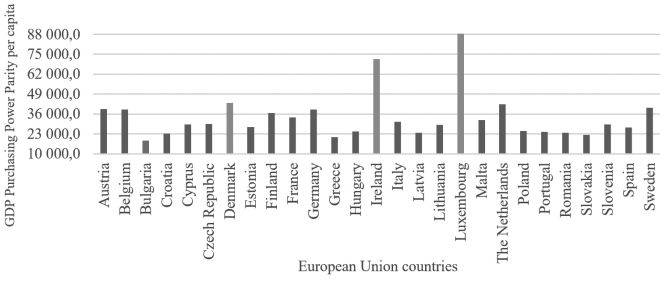
Figure 2 illustrates the value of GDP per capita in 2021 in the studied countries. The results show that, if only this measure is taken into account, Luxembourg, Ireland and Denmark have the highest levels of prosperity, while Bulgaria has the lowest. A similar order was observed in the purchasing power parity ranking, with Luxembourg, Ireland and Denmark leading the list, and Bulgaria coming last again.

Figure 2: GDP per capita in European Union countries in 2021



Source: own editing, based on information provided by Eurostat

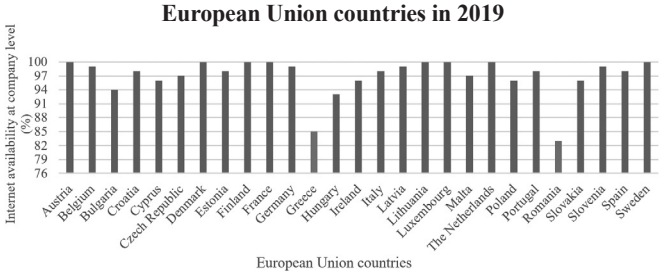
Figure 3: GDP Purchasing Power Parity per capita in European Union countries in 2021



Source: own editing, based on information provided by Eurostat

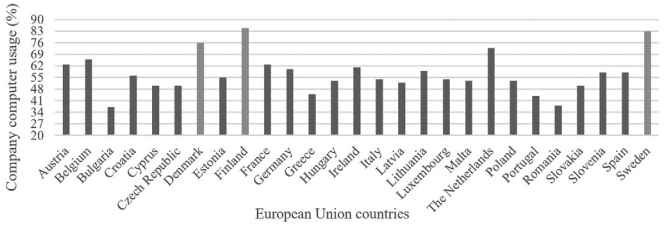
The third factor in the analysis was internet accessibility. Since 2019 is the latest data, I used it for the calculations. What I would like to highlight from the chart is that while 25 countries have internet availability for companies above 90%, Greece and Romania only have 85 and 83% respectively.

Figure 4: Internet availability at company level in European Union countries in 2019



Source: own editing, based on information provided by Eurostat

Figure 5: Company computer usage in European Union countries in 2021



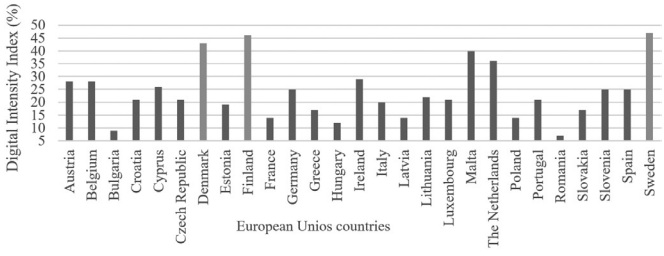
Source: own editing, based on information provided by Eurostat.

Also part of the analysis is an examination of companies' use of computers. These data are presented in Figure 5, where we can see that the highest values are found in Finland, Sweden and Denmark, with 85%, 83% and 76% respectively.

Another important indicator is digital intensity, which measures how many different digital technologies use companies and to what extent they use them in their activities, covering technologies such as: the existence and quality of companies' websites, the diversification of their services, the level of use of 3D printing, the purchase of cloud-based IT services, the possibility of sending bills that can be processed automatically, but also the use of industrial or service robots.

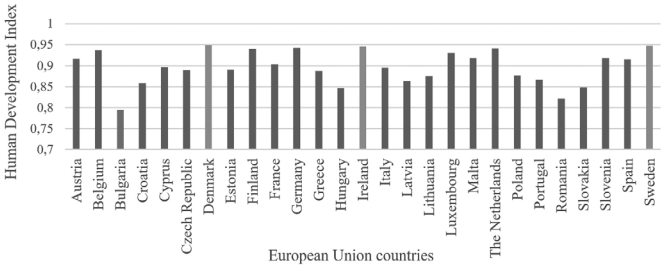
These are summarised in Figure 6, in which, as before, Sweden, Finland and Denmark were in the lead.

Figure 6: Digital intensity in the European Union countries in 2021



Source: own editing, based on information provided by Eurostat

Figure 7: Human Development Index in the European Union countries in 2021



Source: own editing, based on information provided by Statista

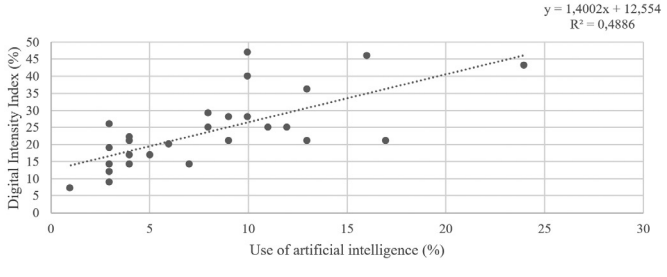
Finally, the last indicator that was examined in the correlation searches was the human development index, which estimates life expectancy at birth as a function of literacy, education and living standards. This value is defined within a 0-1 interval. Denmark, Sweden and then Ireland had the highest scores on this index, in turn the lowest scores at Hungary, Romania and Bulgaria (United Nations Development Programme, 1990).

Correlations

After aggregating the data and searching for correlations, linear regression calculations were used to examine the values of using artificial intelligence with all other variables in turn. Firstly, it was compared with GDP per capita, however, the R2 value did not show a strong relationship between them, which came out to be 0.2704. And although a similar ordering was previously found for the two factors when searching for correlation, the weakest relationship was found between purchasing power parity and the use of artificial intelligence, with an R2 of only 0.1728. When testing for corporate computer use, it was also found that there was no strong relationship between the factors, but was the highest value so far: 0.3635.

As for internet accessibility, the R2 indicator (0.268) also found a weak relationship, similar to the previous aspects, so the existence of a correlation could not be proven. Where the strongest relationship was found was between AI and digital intensity, with a moderately strong relationship based on R^2.

Figure 8: Finding correlations between the use of artificial intelligence and digital intensity in the European Union countries



Source: own editing, based on Eurostat data

Finally, for the last factor, the human development index, a weaker than medium relationship was also observed, although compared to the previous ones, except for the digital intensity, a higher correlation was found, as the R2 value was 0.396.

Then I used a two-sided T-test to determine the significance between the factors. The results show that in all cases, except for the GDP-Purchasing Power Parity per capita, some degree of significance was found (Gosset, 1908)

Table 1: Double-sided T-test

	GDP per capita	Purchasing Power Parity	Internet availability
Correlation (r)	0.519993477	0.415632622	0.517717899
T-stat: r *√(n-2) / √(1-r^2)	3.043851554	2.284869334	3.025638827
p-value	0.54%	3.11%	0.57%
Conclusion	Significant relationship	Not significant	Significant relationship
R2	0.270393216	0.172750477	0.268031823

	Company computer usage	Digital intensity	Human Development Index
Correlation (r)	0.602940924	0.699020788	0.629264804
T-stat: r *√(n-2) / √(1-r^2)	3.77883948	4.887564474	4.048328058
p-value	0.09%	0.005%	0.044%
Conclusion	Strongly significant	Very strongly significant	Very strongly significant
R2	0.363537758	0.488630063	0.395974193

Source: own editing

After examining the strength of the relationships, a regression calculation confirmed the previously mentioned statement, proving that there is a strong correlation between the use of AI and digital intensity. The results of the regression calculation are shown in the following table, where we can conclude that there is a correlation between two factors, when the value of the indicator p is lower than 5%. (Galton, 1889).

Table 2: Results of multivariate regression analysis

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.750653508							
R Square	0.56348069							
Adjusted R Square	0.45954752							
Standard Error	3.925731053							
Observations	27							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	5	417.7687572	83.55375	5.421567476	0.002347122			
Residual	21	323.6386503	15.41136					
Total	26	741.4074074						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-14.5695107	37.27895144	-0.39082	0.699864021	-92.09533423	62.95631282	-92.09533423	62.95631282
GDP per capita	5.82883E-05	4.76566E-05	1.223088	0.234844913	-4.08191E-05	0.000157396	-4.08191E-05	0.000157396
Internet availability	0.259656959	0.236301898	1.098836	0.284278518	-0.231759739	0.751073658	-0.231759739	0.751073658
Company computer usage	-0.043799877	0.134357622	-0.32599	0.747654594	-0.323211848	0.235612094	-0.323211848	0.235612094
Digital intensity	0.309478144	0.143508937	2.156508	0.042788567	0.011034972	0.607921315	0.011034972	0.607921315
Human Development Index	-10.41977319	41.97451919	-0.24824	0.806359741	-97.71056442	76.87101805	-97.71056442	76.87101805

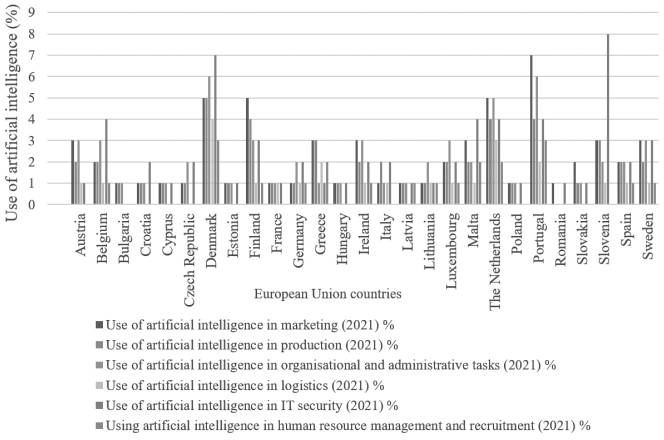
Source: own editing

Based on the multivariate regression analysis (Table 2), the five independent variables (GDP per capita, internet accessibility, corporate computer use, digital intensity and human development index) explain 45.95 percent of the variance of our dependent variable, the AI index. Testing this regression with the F-test, a generalized version of the T-test, we find that there is also a significant relationship between the explanatory variables and the dependent variable.

The use of artificial intelligence in six selected fields in European Union countries

Although we have seen earlier how often companies in some countries have used some AI technology, in the following I would like to look more specifically at the extent of its use in 6 areas: marketing, production, organisation/administration, logistics, IT security and human resource management/recruitment. The following figure summarises, at country level, the percentage of companies that have used an AI technology to simplify the activities and work areas mentioned above.

Figure 9: Use of AI in different workspaces across all sizes of companies in the European Union countries in 2021



Source: own editing, based on Eurostat data

The figure shows that Portugal was the country with the highest use of AI in marketing, Denmark was the main user in production, and Portugal and Denmark were the two countries with the highest use of AI in organisation and administration, with 6%. In logistics, Denmark is also in the lead, with the Netherlands in second place. In IT security, Danish companies also made a high use of a AI technology, but this time they came second with 7%, below Slovenia with 8%, which is the highest value seen in the whole table. Finally, in human resources management, Denmark and Portugal again came out on top with 3%-3%.

Based on the average values calculated in the studied areas, it can be said that the European Union countries use AI most in IT security at 2.296%, although marketing came second with a difference of only a few hundredths of a percent, at 2.259%. And the data also reveals that companies use AI the least in human resource management and recruitment, with a rate of less than 1%. These average values are shown in the below table.

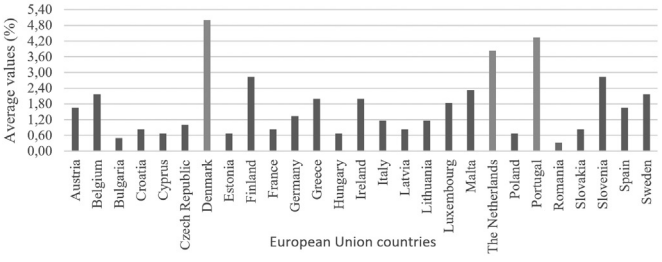
Table 3: Average use of artificial intelligence in selected fields in European Union countries

Fields of application	Marketing	Production	Organisation	Logistics	IT Security	Human resource management
Average values (%)	2.259	1.889	2.148	0.889	2.296	0.778

Source: own editing, based on data supplied by Eurostat

Averages were also calculated for each country, looking at the extent to which companies in the six selected areas were using any of the AI technologies in their work. The chart shows that the highest averages were found in Denmark, Portugal and the Netherlands, and the lowest in Romania, with only 0.33%.

Figure 10: Average use of AI in the six selected areas, by European Union countries in 2021



Source: own editing, based on Eurostat data

I have further disaggregated the previous data by the size of the companies, grouped by the number of employees. Small enterprises are defined as those with between 10 and 49 employees, medium enterprises between 50 and 249, and large enterprises as those with more than 250 employees.

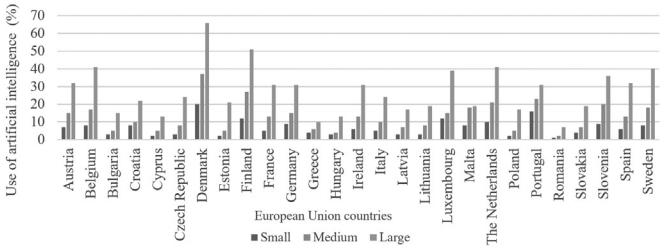
The first summary table shows the degree of using AI technology in small, medium and large enterprises. For small companies, Denmark shows the highest value, with 20%, demonstrating that one in five small Danish companies has used AI technology in their working process. It was followed by Portugal with 16%, Finland and Luxembourg in third place with 12%, and the Netherlands in fifth place with 10%, Romania is in last place with 1%.

In the ranking of medium-sized companies, there are small changes, although Denmark still has the highest value with 37%, followed by Finland, which is now more behind Denmark with 27%, and then Portugal, the Netherlands and Slovenia with 23%, 21% and 20% respectively. Romania continued to be the country with the lowest use of AI, now for companies with 50-249 employees, at 2%.

For companies with 250 or more employees, Denmark also had the highest rate, with an outstanding 66%, which means that two out of every three companies used AI. Finland was also second in this category with 51%, followed by Belgium and the Netherlands with 41% and Sweden with 40%. As in the previous two breakdowns, Romania scored the lowest in this third category with 7%.

Since a correlation with digital intensity has been shown, I would like to highlight this breakdown. What we can see for small companies is that the three Scandinavian countries that have stood out several times before are in the lead, with Sweden at 42%, Finland at 41% and Denmark at 38%. The fourth

Figure 11: Use of artificial intelligence in the European Union countries in 2021, broken down by company size



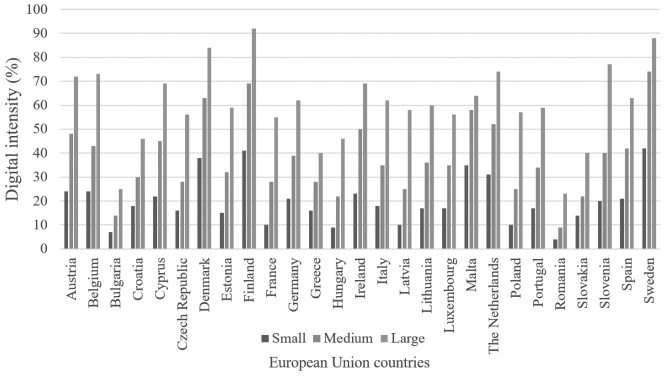
Source: own editing, based on data supplied by Eurostat

highest value has Malta, in the fifth place was the Netherlands, and the last in this category was again Romania with 4%.

For medium-sized companies, a much higher percentage indicated the strength of digital intensity, with no change in the top five, Sweden leading this category with 74% and Romania coming last again, now with 9%.

Finally, for large organisations, Finland took over the top spot from Sweden with 92%, and Slovenia also moved up to fourth place, with Romania, as usual, coming last with 23%.

Figure 12: Digital intensity in European Union countries in 2021, broken down by company size



Source: own editing, based on data provided by Eurostat

Data used

In a similar way to what I did before, I looked for correlations between different indicators and the use of artificial intelligence, but now broken down the values by company size, in each category. Again, for small companies, I found a moderately strong relationship only for digital intensity, as the R2 was 0.3967, and then moving on to regression analysis, it was shown that there was a significant relationship between these two factors.

In the case of medium-sized companies, in addition to digital intensity, a medium-strong relationship was also found for companies' computer use, but in the regression analysis, significance was not confirmed for any of them. In contrast, for large companies, a significant relationship between the use of AI and digital intensity was demonstrated in the regression test, with an R2 of 0.5899.

The level of AI implementation was then broken down into the earlier identified six fields of study, by size of company. The averages of the European Union countries are summarised in the below table.

Table 4: Average use of artificial intelligence in the European Union countries in selected areas by company size

Average values (%)	Marketing	Production	Organisation	Logistics	IT security	Human resource management
Small	1.889	1.296	1.538	0.630	1.630	0.630
Medium	3.444	3.259	3.222	1.481	4.185	1.185
Large	7.741	9.481	8.222	5.481	11.462	3.481

Source: own editing, based on Eurostat data

The table shows that while small companies make most use of AI in marketing, companies larger than them make more use of it in IT security, and one in nine of the large companies in the EU use it in their activities. However, it is also clear that the areas where they have been least able to take advantage of the fastest developing technology of the 21st century is in human resource management, which is somewhat consistent with the literature, saying that the areas of work where AI will have the greatest difficulty in taking over are those where it is necessary to build and support human relationships.

CONCLUSION

The research found that there is a correlation between the use of AI and the strength of digital intensity in the European Union, which means that the higher level of digital intensity in a country results a greater integration of AI in the performance of different activities and jobs. And although a certain degree of association was also shown for the other measures, the regression analysis failed to prove the significance of the strength of the relationships.

The research also showed that Scandinavian countries are often using AI in various fields, while Portugal, the Netherlands, Belgium and Slovenia are also keeping up with the pace of implementing the fastest growing technology of our century in the corporate world. We also found that Portugal is leading the way in the use of AI in marketing, as well as in organisation and administration, human resource management and recruitment, along with Denmark, which has the highest adoption of AI technologies in production and logistics, and last but not least, Slovenia in the area of IT security.

Of the six selected areas, IT security is the one where AI is the most implemented. By contrast, the slowest digital uptake is in logistics and, above all, in human resources management and recruitment.

The extent to which artificial intelligence will take over jobs from humans in the future is difficult to measure, and this is not the question that research is meant to answer, but the

percentages suggest that the development of artificial intelligence will not threaten the majority of humanity in the coming years. However, it is worth taking into account the recommendations in the literature for people starting out in their careers or those who will be working for many years, learning skills that they can put to good use in a few years' time, in preparation for the digital transformation.

I would like to conclude with some thought-provoking lines from David De Cremer and Garry Kasparov. In their article, they reassure readers that AI will not be able to fully replace humans, because that would assume that humans have the same qualities as machines as AI does, which is not true (Cremer & Kasparov, 2021)

While it is true that machines can work faster, more accurately and rationally, they are not intuitive and are not culturally or emotionally sensitive, which are qualities and advantages that humans have. Thus, it is much more conceivable that in the future, machines and humans will work together in harmony, complementing each other's work, leaving machines to perform routine tasks that are not influenced by external factors, thus leaving humans with the capacity and knowledge to perform more complex tasks that cannot be done routinely, but only with creativity, adaptability and responsiveness (Cremer & Kasparov, 2021).

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MOTIVATION AMONG EMPLOYEES IN MULTINATIONAL CORPORATIONS

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Abstract: *Nowadays motivation plays a huge role amongst employees especially when we relate it to people working in multinational companies for example Pepsi, Coca Cola, Nescafe and many more. Motivation is a topic that relates to all of us. It is very essential for employers to seek and recognize what motivates an employee. Many people underestimate the benefits and importance of human resource management in their businesses or day-to-day life. When we talk about human resource management, we are talking about human capital. Human capital emphasises the ability, skills, and the personality of the person you are trying to recruit or employ. In this study, we wish to analyse the importance of how motivation stands out in employees in different types of offices/workforces. The different aspects in multinational corporations show different characteristics.*

Keywords: *motivation, multinational companies, employees*
(JEL code: J24, F23)

INTRODUCTION

The importance of human resource management is huge. The first point we can discuss is HRM being integrated into companies, human resource management must be in every company because without them the company would be lacking many excellent employees with great skills, abilities and values. Out of all the types of management, HRM is considered the most active type of management. From the word itself human resource management, a human that has great skills, great psychological skills and can tell whether or not the person they are trying to recruit/employ is a good person for the company, will increase the companies ranking and more people will want to join in the community of the workplace.

Linking human resource management to a business is very vital for the human resource management in the business to deliver its commitment towards the business/organisation. Such tasks could vary from motivating employees, deriving higher performance from them through various training opportunities and workshops. A successful business will thrive on teamwork and making sure their employees are in a good mental state and can achieve the maximum so that the business can succeed.

The author of the article "Employee motivation: Just ask your employees", (Dongho, 2006), argues about how employee motivation is a very complex topic, as well as it being a big concern for organizations and managers since motivation is a factor that mostly decides the performance of an employee and the success or the failure of the business, because without the employee being well motivated or up-to-date the organization will fall into a big risk of failure since they are lacking this factor.

Managers are the main characters for all companies especially when it comes to understanding the different employees in their business, they need to be able to adapt many characteristics and skills that will influence them and their employees. The world is leaning towards an economical global system such that international business becomes more favourable. The movement towards a global economy is an advantage for firms as it allows them to go international. This movement has a certain effect on managers. Whilst managing multinational companies managers need to recognize that it is not the same as managing a small company. Many firms are moving outside their domestic borders. Which means that globalization/diversity of businesses has a significant impact on the management system. Having an integration between European markets and North American markets, along with developments in the Asia-Pacific region, intensifies this impact remarkably (Dowling et al, 1998). Managers are forced to gain and sustain a competitive advantage. As (Morley & Collings, 2004) point out that for multinational companies it is very important/essential for them to have a very effective Human Resource Management and a great degree of involvement in their workers/employees.

Although employee motivation is a well-researched topic, most studies have tended to focus on small firms. People, when they want to work in an organization, usually choose to work in an organization depending on what the organization offers them, which supports the study already done (Moy & Lee, 2002). There are many studies on human resource management within multinational companies, but not enough studies on employee motivation within these organisations.

The main purpose of this research is to examine what actually motivates these individuals to work. The target is employees working in multinational companies internationally. To achieve this goal, the theories and concepts of factors that influence workplace motivation need to be identified. The research also provides insights into how employees and students who are about to enter the world of work relate to motivation and what motivation means to them. To analyse this, a questionnaire and interviews were conducted. As a result, we draw conclusions from the literature review and primary research and make suggestions for the future.

MATERIALS AND METHODS

The main research questions that this research revolved around were as follows:

- What is work motivation, and why is it important to employees working in multinational companies?
- What are the main factors, concepts, and theories that influence the employee's motivation in multinational corporations?
- How does culture diversity play a role when being introduced in multinational corporations among employees?

Many different articles were used during the literature review, these articles explained either motivational theory, factors, and concepts, these different reviews were put to describe the topic 'Motivation among employees in multinational corporations', and how they serve an important role to employees working in different MNCs. During the literature review, a comprehensive search was done across various databases, which included Google Scholar, and Statista, gaining insights from these databases on different aspects that influence in employee motivation.

The survey and interview instrument were designed based on insights gained from the literature review, which incorporated questions that explore factors that related to employee motivation within multinational corporations. The survey consisted of multifaceted questions such as open-ended question to capture qualitative insights, linear-scale questions to see the different perspectives of the participants, check-box questions allowing participants to choose more than one option that suits to their liking, and multiple-choice questions only allowing them to choose one option, where these capture quantitative insights. As for the interview, open-ended questions were asked to the interviewee to see the different perspective on the various topic.

The survey included 103 respondents, a random sampling method that was employed to select survey participants and the questionnaire is not representative. Two distinct groups were targeted: employees who are currently working in different companies, and students who are soon to be exposed to the future work environment. Participants were selected based on their relevance to the study's goals and accessibility. The interview was directed towards an employee interviewee who they used to work in a multinational company, the employee was chosen based on their years of experience, the job role position they had, and the specific company they worked in.

The survey that was conducted was administered electronically using a secure and confidential online survey platform. Before the participants were able to answer the following questions, they were provided with a brief description of the topic and informed that their answers were strictly confidential. For the interview, the selected participant for the interview was informed with a brief description of the topic and was given beforehand the questions that would be asked during the interview. The interview was audio-recorded with the participants' approval and consent before doing so, to ensure the participants comfort throughout the interview process.

The data analysis of the survey will be subjected to quantitative and qualitative analysis. Quantitative data analysis will involve descriptive statistics and different graphs that analyse the different responses we have gotten from the participants, as for the qualitative data analysis from the open-ended questions, these will be subjected to extract only the key insights that we believe are important. The data analysis for the interview will show direct quotations from the participant's side as this will represent what the participant responded, to and the different perspectives given during the interview. By the end of collecting both data analysis; survey and interview, to enhance, a comparison of both the findings will be stated to see the similarities and differences between the survey participants' answers; Graduates and Undergraduates, and the interviewee's answers on the different questions it was asked.

RESULTS AND DISCUSSION

Motivation is a very complex concept, it can be defined in many different ways, two different people have given two definitions, one (Latham, 2007) where he writes that "The term motivation comes from the Latin word for movement, movere". Other author (Bjorklund, 2007) defines it as "Motivation can be described as the need or driving force that motivates a person to some behavioural action. The verb to motivate means to give a reason for action". Motivation has a very important role, which we need in everything, especially when it comes to work. Without motivation, many people in the workplace would slack off and not really care enough about their work, and with that comes a huge risk of the company falling into failure or a decline in success. Every person deserves to wake up in the morning and be happy to go to work. Most people are easily persuaded, so if an employee is told that they are going to get a pay rise, they will be even more motivated to work harder and put all their energy into their work. This shows that in order for a worker to experience motivation, he or she needs some reward, study of work motivation in seasonal workers confirms that motivation varies across workers (Lundberg et al., 2009).

Motivation can be categorized into broad concepts; these broad concepts explains where an employee can be positioned based on how they work or how they think of work. How an employee might think all relates to its human behavior and how its influenced, especially helping others to identify and understand why people do what they do.

Motivational theories provide fundamental frameworks for illuminating the complex aspects that shape human behaviour and performance in organisational situations. Understanding these ideas becomes critical to analysing the complicated landscape of motivation as employees get introduced to many different cultures, diverse leadership styles, and dynamic work environments of multinational companies. This section explores significant motivational theories that shed insight on the dynamics of motivation among employees in MNCs, it will delve into the two classical need theories which are: Maslow's Hierarchy of Needs, and Herzberg's Two-Factor Theory.

Abraham Harold Maslow theory

Abraham Maslow's Hierarchy of needs stands as an early theory concerning work motivation. Maslow's theory of needs, which ranges from basic physiological needs to higher-order psychological desires, provides a foundational understanding of motivation (Maslow, 1943). According to Maslow there are five human needs: physiological, safety, belongingness and love, self-esteem, and self-actualization needs.

Physiological needs represent that the most important needs for human survival are food and water. An example; if a person is hungry and does not have enough food or water, he will prioritise eating and drinking over all other needs. When a person's basic requirements are met, he or she will endeavour to meet other needs. After the physiological needs have been satisfied and met new needs will be approached. These new needs are known as safety needs, which allude to security, stability, and protection. As in the previous example with physiological needs, new needs have now taken over because earlier needs have been met (Maslow, 1970). Now a person may now seek a good job with decent working conditions, a good income, and a solid retirement plan (Adair, 2006). Once the Security needs have been met and satisfied, one can move up to the next rung of the pyramid, so that new needs are created and the process repeats at the next level (Social needs). Once the basic needs and security needs are met, a person will seek to find good relationships with other people; this could be either through love or through even seeking love from others. This could be because we desire to be a part of a group of friends, co-workers, or family members. On the other hand, once satisfied with the other needs, a fourth need comes to be arised, this is the Esteem or self-esteem need. In this group, we find factors such as; desire for strength, achievement, independence and freedom, desire for reputation, respect, attention, recognition. The final level of the pyramid is what Maslow called the self-actualization need. The self- actualization need "refers to a man's desire for self-fulfilment, namely, to the tendency for him to become actualized in what he is potentially" (Maslow, 1970).

To sum up, a fulfilled need is no longer recognized as a need by a person. The individual is dominated, and his/her behaviour is determined solely by unsatisfied desires. These unmet needs can be very well used to motivate employees.

Fredrick Herzberg theory

The two-factor motivation theory, otherwise known as Herzberg's motivation-hygiene theory or dual-factor theory, argues that there are separate sets of mutually exclusive factors in the workplace that either cause job satisfaction or dissatisfaction (Herzberg, 1966; 1982; 2017).

Influenced by Maslow's Hierarchy of Needs, Herzberg concluded that satisfaction and dissatisfaction could not be reliably measured on the same continuum and conducted a series of studies in which he tried to determine what factors in the work environment caused satisfaction or dissatisfaction. Herzberg and colleagues investigated the impact of fourteen factors on job satisfaction and dissatisfaction in terms of frequency and duration of impact (Bassett-Jones and Lloyd, 2005).

Herzberg identified two factors that can increase or decrease job satisfaction: hygiene and motivation. While hygiene factors are related to "the need to avoid discomfort", motivational factors lead more directly to job satisfaction because of "the individual's need for self-improvement and self-actualisation" (Syptak et al., 1999).

The traditional understanding of job satisfaction assumes that job satisfaction and job dissatisfaction exist on the same continuum; workers who have no reason to be satisfied with their jobs must be dissatisfied (Robbins and Judge, 2013). According to Herzberg, motivational factors are extremely important for improving job satisfaction, which motivational factors are found in work.

There are other theories too in connection with motivation. Vroom's (1964) theory posits that people will be motivated to the degree that they believe that (1) effort will yield acceptable performance (expectancy), (2) performance will be rewarded (force/instrumentality), and (3) the value of the rewards is highly positive (valence).

These were the main motivational theories, and there are others, but we do not intend to present any more motivational theories in this paper.

After clarifying the concepts of motivation and motivational theories, the differences between multinational corporations and small companies and the differences in employee motivation in these organisations will be presented.

Multinational companies differ in many ways from national companies in terms of size, number of employees and the opportunities for employees to move up the ladder. Small companies often hire young people to work for them because they do not have certain appropriate skills (Reid & Adams, 2001).

Another difference is how motivation of employees differs in these different organisations. Since multinational companies are said in many studies to pay higher wages to their employees, while on the other hand small companies are usually start-ups that only pay a small wage to the employees working for the company. Many employees would prefer to work for multinational companies because they pay

higher wages and this is what motivates them more and better. Multinational companies not only pay higher salaries but also introduce a number of incentive rewards. Many graduates believe that small companies do not offer the same level of expertise as a large company, which can be called a multinational (Moy & Lee, 2002).

There are many companies, which operate around the world, and the employees working in those companies come from different cultures, having different values, beliefs, morals, and religions. Each of these employees work in their own kind of way and work in a way they are used to depending on their cultures, where they come from, and the different traditions they might follow. The diversity in the culture in the workspace influences the motivation of the employee and show, how the global companies deal with the complex/challenging job of motivating their employees coming from all around the world. In this section, we will explore into the relationship between culture and motivation within multinational corporations.

For example, the characteristics of the Islamic worldview are very different from the Western worldview. In the Islamic worldview, the physical and non-physical realms that make the scope of the Islamic worldview very broad. In contrast, the secular Western worldview places humans and nature as the central concept in its worldview. It is what makes the spectrum of the secular West worldview only revolve around the physical world. In this study, the authors have found that the model, structure, form, spectrum, and reach of Western and Islamic work motivation theory are different (Fuad Mas'ud et al., 2023).

A real-life example of two companies that are known globally are Apple and Samsung. These two companies are two well-known companies found around the world, and they have employees who are adapted to different cultural backgrounds these employees have a different mind-set when they come to meet with the other employees working in the same company as they are. Apple uses the style technique of innovation and creativity they value it a lot but in a way of coming from one employee rather than with a team. The aspect or style technique that they use motivates Apple employees to come up with more and more creative products and solutions. As for Samsung, Samsung employees find motivation by enhancing in group work, sharing ideas with one another, and getting help from each other.

To conclude, both big global companies must handle these cultural differences well so that they can motivate all their employees in an effective way as they come from different cultural backgrounds and get motivated in different ways of styles.

Effective communication and feedback mechanisms are both critical components in motivating employees within multinational corporations. When it comes to communication and giving feedback to one another at work culture comes in and plays a huge role, and this is how motivated employees are.

Result of the questionnaire

For the reasons mentioned above, we also carried out a questionnaire survey to find out what the most important motivational and other influencing factors are in multinational companies.

The first section of the questionnaire consists of general information where they include the demographics of the participants. The result showed a near-equal representation of male (50.5%) and female (49.5%) respondents, reflecting a balanced gender distribution among those who contributed their perspectives. This gender diversity is important since it ensures that the findings and conclusions drawn from this research encompass a diversity of viewpoints and experiences.

The target audience was both students who will eventually be future employees and current employees who are already employed in companies. A significant portion of respondents, constituting 30.1%, falls within the under-25 category, this demonstrates the engagement of young individuals in this research area and how this age group is still preparing for their future careers. On the other hand, 32% of participants fall into the 25-34 age group, well highlighting the active involvement of early mid-career individuals. Additionally, respondents aged 35-44 age group was 29.1%, and the 45-54 age group was 6%, and up to 55 age represented less than 3% of the respondents, these participants show a representation of experienced professionals who have come across different career stages in their life's. By asking the participants of their age range, it gives us a clear understanding on where they stand either on how well experienced or still experiencing, they are. It as well allows us to explore how these different age groups perceive motivation either by being employees or students preparing for their future career path into becoming employees of the future.

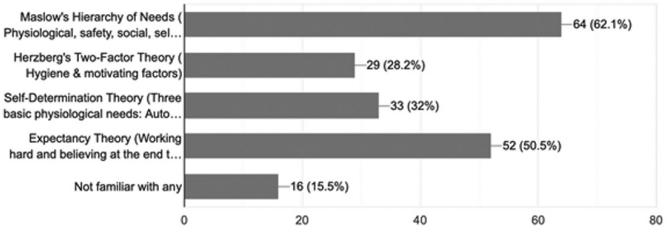
The survey spanned across distinct nationalities, with a significant representation of 23% originating from Jordan and 21% from the United Arab Emirates (UAE), 7% from India, 6% from Egypt, 5% from the UK, 3-3% from Iraq, Palestina, and 2% from Hungary, Pakistan, Lebanon, Philippines, Syria, and the other respondents come from other countries. This rich cultural diversity within the respondent emphasizes the varied perspectives and experiences that were brought to the subject.

We asked about the participants' educational background and current employment status. A significant number of participants (78%) are full-time employees compared to 22% unemployed.

After the demographic questions, we asked the participants' "Indicate your familiarity with the following motivational theories commonly used in multinational companies".

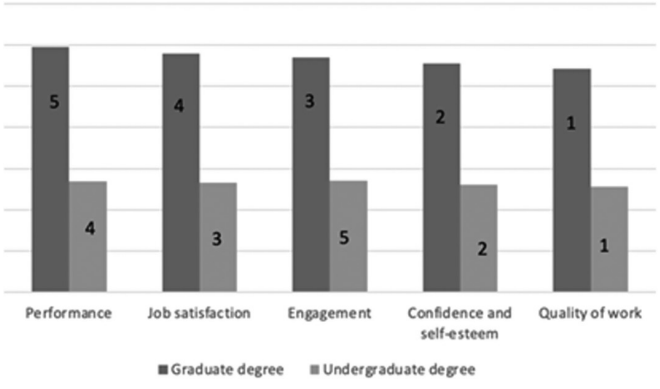
Figure 1, participants were given the choice to choose more than one option. The graph reveals that the majority of the participants indicates their familiarity with 'Maslow's Hi-

Figure 1: Level of familiarity of the theories (n=103)



Source: Own survey response, 2023

Figure 2: Affect of your motivation on the different descriptions (n=103)



Source: Own survey response, 2023

erarchy of Needs' theory (62.1%), followed by 'Expectancy Theory, i.e. working hard and believing at the end that their work is recognized and rewarded (Vroom, 1964) (50.5%). The other theories have less familiarity by the participants, Self-determination theory known by 32% of the respondents, Herzberg's two-factor theory 28.2%, and 15.5% of the respondents not familiar with any theory.

Participants had the opportunity to choose from a scale of 1-5 to show the level of importance of motivation among employees working in multinational companies. The results show that 81.6% of the participants believe that motivation is extremely important, and 15.5% of participants believe that motivation has a lower degree of importance on employees.

After that we questioned participants if they were put in the shoes of an employee working in MNCs, they had to prioritize each factor from 1-5, 1 being least priority and 5 being the top priority. Both graduates and undergraduates chose the factor 'High salary' to be put as top priority (5), then comes the 'Personal growth and development' (4), 'Recognition' (3), 'Supportive colleagues and managers' (2), and for the least priority (1) they chose the factor 'Good atmosphere'.

then we asked 'What do you think, who are the global companies, where the motivation has greatest emphasis towards their employees? (you may select more than one option)'. In the opinion of the participants, it shows that the top 10 MNCs where motivation has the greatest emphasis towards their employees are: Google (75.7%), Apple (65%), Amazon (32%), META (27.2%), McDonald's (17.5%), Coca-Cola Company (15.5%), Samsung (13.6%), Nescafe (10.7%), Pepsi (7.8%), and Microsoft (1.2%).

After all, we would like to know 'How do you think cultural differences might influence the employee motivation in multinational companies?' The answer options were the following: absolutely (5), moderately (4), slightly (3), not at all (2), not sure (1). In the results all scores indicates that cultural differences moderately (4) influences employee motivation in MNCs, for both the graduates and undergraduate participants.

In the next question participants have been asked how strong their motivation will affect the below statements if they were to be employees in multinational corporations. Furthermore, the results shows the rank between 1-5, where the graduate's outcome of their motivation will strongly affect their performance (5), a job satisfaction (4), engagement (3), confidence and self-esteem (2) and quality of work (1) was the last. As for the undergraduates their outcome was different, they believe that their motivation will have a strongly affect on their engagement (5) and performance (4). On average, the motivation of the employees will significantly affect (4) all the above statements (Figure 2).

The last question of the survey was an open-ended question, participants were asked to reflect on their different insights or conclusions drawn from the topic on "Motivation among employees in multinational corporations". These qualitative responses provided a valuable context and depth to complement the quantitative data, which was gather earlier in the survey. 'Participant 1' gives an insight which states "Motivating employees in multinational corporations requires acknowledging diverse needs, and promoting a sense of purpose at work. Effective leadership, cultural sensitivity, and career development opportunities are crucial. Work-life balance, open communication, and fair performance metrics also contribute to a motivated workforce. Keep in mind that strategies should be tailored to the unique context and culture of each organization." The participants response offers a great view where it emphasizes the importance of how the diverse needs of employees should be acknowledged and seen in these big global companies, as well as balancing in both intrinsic and extrinsic motivational concepts, promoting effective leadership, cultural sensitivity, and career development. Overall, this response gives a well-rounded perspective on the multifaceted dimensions of motivating employees in the complex context of MNCs. 'Participant 2' states "Good managers create motivated employees", this response from the participant capture the fundamental role of effective leadership in fostering employee motivation. It proves the idea that managers, through their actions, behaviours, and leadership styles, can significantly influence employee's motivation levels. Effective managers often grasp the skill of having good communication skills, team building, and recognition of employee contributions. These skills once managers surrounding them around the employees especially those working in MNCs, they will tend to inspire and empower them, as well they will be even more motivated and engaged in the work they do.

Result of the interview

The interview participant gave his insight on whether employee motivation is important and why he believes it is important when working in multinational companies by stating, "Intrinsic motivation is a crucial concept. It can be summarized in the three C's of intrinsic motivation: Collaboration, Content, and Choice. Collaboration: employees feel more motivated to work hard when they are inspired to cooperate and have an opportunity to succeed. Content: employees feel more motivated to work hard when they can appreciate how and what they are doing contributes to the work community. Choice: employees feel more motivated to work hard when they feel empowered to make decisions about their work".

The participant believes that employee motivation is important when connecting it to intrinsic motivation, by creating a strong environment, where employees will feel encouraged and pushed to work harder. As well as giving employees, the help in making them feel they are appreciated and having interest in the work, they give. In addition, allowing employees to make decisions, as they will feel empowered, these are all a very good way to describe the importance of employee motivation and why it is important, since without making they feel appreciated, or giving them even a sense of encouragement employees will not quite work well in the company. Interview participants answer to the question was ". The three forms of motivation of significant factors that motivate employees which managers use most often are fear, high-salary, and the opportunity for personnel growth. Fear and high-salary can undermine motivation to perform, while the opportunity for personnel growth can help us encourage our employees to feel motivated to perform at high levels". The next question was: 'How do you perceive cultural diversity impacting employee motivation within the context of company, and can you provide, if any, an instance where cultural diversity played a role in posing challenges to employee motivation?'. "Cultural diversity is a significant factor in implementing motivation, particularly in multinational companies. Nevertheless, local laws or practices are forced in terms of wages, positions, and benefits. Multinational companies have solutions that include relocating employees to another company location (abroad) with higher positions and wages to motivate them." The participant's point of example about offering employees to relocate to different company location is interesting as this can give the employee a wide range of opportunities to learn from the different people they meet from different cultures, as by learning from them they might grasp learning, get motivated by it, and use it along their work life. Embracing diversity through training for employees can indeed turn it into a source of strength. Finally, he mentioned, "Hands-on management can motivate staff and make their job easier by providing the right tools. There is a set of KPIs (Key Performance Indicators) for each company/region of the operation that motivates the employees and management to be on the top rank of their region and receive incentives and bragging rights." The insights on both hands-on management and the use of Key Performance Indicators to motivate employees in multinational companies highlight the significance of effective leadership. By let us say managers providing the right tools and setting clear KPIs demonstrates/shows how leaders can drive positive results within the organizations of multinational hotel chains. With these effective leadership practices, it will result in a competitive work culture.

Findings for the interview showed how an actual employee working in a multinational company reacts to the different questions given to the participant to answer. During the interview it was seen that the use of the motivational concept 'intrinsic motivation' is being used when it comes to the importance of motivation on employees in multinational company. As well, high-salary is a significant motivating factor for employees to work harder and put enough more and more effort in what they do, furthermore. Cultural diversity was highlighted to be as a relevant challenge in multinational company, but strategies such as giving cultural diversity trainings by relocating employees to exotic hotels were given and discussed as solutions, effective leadership having hands-on management and Key Performance Indicators (KPI's) lead/contributes to the motivation of the employee.

To conclude the results and discussion chapter, during the research to enrich and boost the study a creation of a survey was done it was given out to graduates and undergraduates meaning targeting both employees who are working full-time, as well as students who are soon to be exposed to the future work-life. In addition, after collecting the data analysis from the survey, an interview was conducted where a participant who used to work in a multinational company.

While collecting the results of both the survey and the interview, there were different similarities and differences collected from both sides. One of the differences from the perspectives of the target audience in the survey and the interviewee was that both sides have their different ways of motivation when it comes to how their motivation would affect MNCs or how it affects it. Participants' results in the survey showed that when it comes to cultural diversity influencing employee motivation, it showed that it would moderately affect them. As for the interview, the interviewee said based cultural diversity has an impact on employee motivation it hugely influences them.

The similarity is, that both participants in the survey and the interviewee believe that the factor of high salary should be put in leading, and top priority, as well, it influences them in motivation and for them to work harder to achieve and get it. High-salary is a high motivator to everyone, it helps push people to work hard and put in all the effort they have in the work they like to do.

CONCLUSIONS

Motivation among employees in multinational corporations plays a crucial role in today's world. These global companies have diverse cultures, languages, traditions, and work environments, making the task of motivating employees in a diverse workforce more challenging. For us to be able to understand these diversities we need to look into the different approaches such as theories, factors, and definitions, which define different aspects of the topic. Each factor, theory, and definition that was chosen in the literature review are very important to the topic since they play a huge role in many ways. We started it off with work motivation, as motivation especially in global companies is challenging since it is the driving force behind an employee's willingness to put in effort, strive to reach their goals, and engage in various tasks. Motivational theories offer valuable frameworks to comprehend and address the diverse needs of employees in MNCs. After the theories, we delve into the motivational factors, motivational factors within MNCs are very important to the employee's professional journey within the organization since if an employee grasps any factors such as social, recognition, or even high salary they will somehow either be promoted, known, or even boosting in their self-esteem. Lastly, we speak

about multinational corporations and cross-culture influence on motivation, how they both operate, and have important roles affecting an individual.

In conclusion, we believe that MNCs should always have a look out for their employees especially them being global companies, as they are known worldwide and their motivational strategies to their employees should always be updated. Balancing between both global consistency and local relevance ensures a motivated and engaged workforce as MNCs.

In conclusion, the combination of conducting both research methods a survey and an interview shows the different sides of how people think towards the topic of motivation. Among employees in multinational corporations, and how an actual employee that worked in an MNC how the participant acts towards certain cases and what insights they can give towards the questions that were asked to him. These research methods have allowed for a well-rounded and multi-dimensional exploration of the research questions asked.

We believe that multinational companies should prioritize in recognizing and valuing more there employees in ways of implementing appreciation programs. Where this program happens on a regular basis, it can include having employee of the months awards, peer recognition or even team achievement acknowledgements, by implementing this program employees will have improved job satisfaction, increase in their motivation to work, boost in their morale. Another recommendation that we would like to add is giving employees in multinational companies more bonuses. For example in the UAE once an employee proves him/herself with the work they do, they get bonuses either on their salary or either an extra bonus of day off, this encourages employees to stay in the company they work in and motivates them more into working harder than they usually do. Lastly, multinational companies should provide health and wellness initiatives including for example gym memberships and healthcare coverage providing these initiatives could boost in the well-being of the employee. Overall, multinational companies should always try to encourage, motivate, push, and spread positivity in between their employees, as these employees work in huge companies, and companies like these needs to try their best as it can sometimes be hard into achieving all of these towards their employees.

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POTENTIAL USES OF BLOCKCHAINS IN HUMAN RESOURCES

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Abstract: *Blockchain technology offers businesses many opportunities for more efficient operation and safer data management. It also becomes easy to store and share employee data, while the blockchain guarantees that it does not fall into unauthorized hands. The management of financial transactions and the automation of the payment process are also a great advantage for businesses, which can manage the payment of wages and benefits more efficiently. Another area of application of blockchain technology is the creation of more efficient workflows that can improve productivity and reduce costs. The management of work schedules and optimized work processes will also be easier with the help of the blockchain, so businesses can become more efficient and effective. In this article, the relationship between HR and blockchains was explored through a meta-analysis based on available related publications.*

Keywords: *Blockchain, Enterprise, HRM,, Human Resources*
(JEL code: M21)

INTRODUCTION

Industrial revolutions increase significantly advance human life (Tuegeh et al. 2021). Explosive changes in technology are having a significant impact on all industries. Robotics, artificial intelligence, cyber physics systems, cloud computing, IoT and blockchain technology, 5G, nanotechnology, 3D printing are all defining elements of Industry 4.0. The integrated use of these methods enables the perception and display of the external environment, which significantly enables improvements in each industry. Nagy et al. (2022) expect in the future a fusion of physical, digital, and biological technologies, which will provide new opportunities for innovative solutions. In their study, the Kovács et al. (2021) point out that the demand-side, platform-based, collaborative economy is spreading rapidly, and its various forms have been part of everyday life for more than a decade. They can be further developed using AI and Blockchain technology.

It is necessary to foster and strengthen micro, small, and medium enterprises (MSMEs) to enhance their growth and develop them as strong, resilient, efficient, and independent contributors to the national economy (Tumiwa and Nagy, 2021). Bittner et al. (2020) underline the importance of strategic planning and its relationship with traditional planning, as well as its differences. Significant changes in the economic, social and natural environment require a more responsible mentality and force companies to make more responsible decisions.

The present and future role of blockchain technology in business has several interfaces with HR and management organization to increase its effectiveness. Blockchain technology enables businesses to manage data more efficiently and securely, which is an important aspect of HR. The technology allows businesses to easily store and share employee data and ensure that it does not fall into the wrong hands. Another important application is the management of financial transactions and the automation of payment processes. Businesses can use this technology to more efficiently manage the payment of wages and benefits and ensure that employees receive their salaries accurately and on time. In addition, blockchain technology also enables more efficient workflows. It allows businesses to easily manage employee schedules and optimise workflows, which can improve productivity and reduce costs (Abu-Md, 2022).

MATERIALS AND METHODS

In the preparation of this manuscript, a meticulous approach utilizing qualitative research methodologies was undertaken to facilitate an in-depth analysis of pertinent materials and to distill substantial conclusions therefrom. To achieve this, I leveraged methods including, but not limited to, comprehensive document analysis, which played a pivotal role in the scrutiny and evaluation of a wide spectrum of materials such as scholarly articles, research studies, and industry reports. To ensure the incorporation of a

robust body of work in this analysis, a methodological review of substantial databases, notably Google Scholar and Web of Science, was conducted. This endeavor was further complemented by a careful examination of various reports alongside an extensive array of documents comprising both studies and reputable publications within the respective field of inquiry. The synthesis of the available evidence, facilitated through an analytical lens, has culminated in a set of informed conclusions that not only underscore the significant findings of this research but also pave the way for further scholarly discourse. Moreover, this intricate process of data assimilation and analysis has laid a foundational pathway, steering us towards the formulation of targeted recommendations. These recommendations are envisioned to serve as a valuable resource for stakeholders within the sector, propelling forward-thinking strategies that align with the evolving landscape delineated through this research.

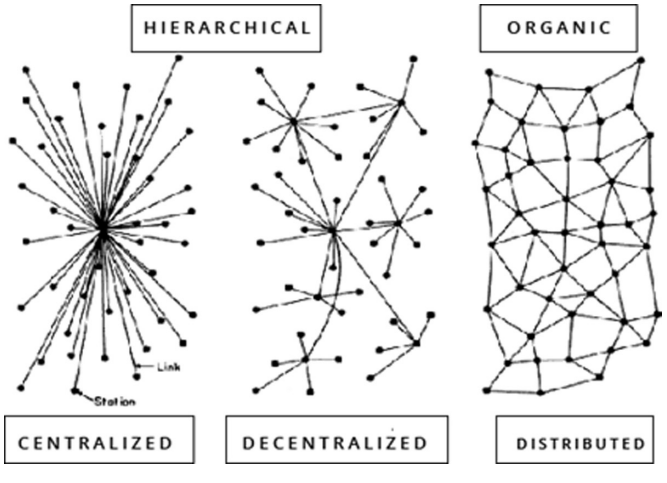
RESULTS AND DISCUSSION

Blockchain phenomenon

A centralised network as shown in Figure 1 is managed by a central unit, while in decentralised networks several units contain the entire general ledger and both networks have subordinate and superordinate roles. When using the Internet, our request is sent to a server, which manages and verifies the data and then sends us the requested information with the appropriate privileges. In distributed networks, there are no subordinate and superordinate roles, all nodes are connected to each other, which increases security and reduces the risk of outages do not cause a complete system shutdown. In a centralised banking system, a hacker attack can compromise the entire system, making it difficult for people to access money and banking services (Györfi et al. 2019).

A blockchain is a decentralised, large open-book database that varies in size according to traffic and the number of users. A blockchain is composed of blocks that are used to store

Figure 1: Hierarchical and organic systems



Source: Barabási (2003)

Table 1: Applications of blockchain technology in large companies

Territory	Process, activity	Company
Financial sector	Payment solutions, authentication, data storage	Citigroup, JPMorgan
Trade	Supply chain, authentication	Amazon, Royal Dutch Shell
Automotive industry	Supply chain, payment solutions	BMW, Daimler
Food industry	Supply chain	Dole Foods, Cargill
Computing	Supply chain, authentication, data storage	IBM, Samsung
Insurance	Authentication, data storage	Anthem, Aon

Source: own edits based on Forbes (2022)

data and are highly secure because each unit has a unique, tamper-proof identifier (Gábor and Kiss, 2019). A blockchain is essentially a distributed database of digital records, transactions and events shared between participants. All transactions are entered into the public ledger, which is controlled by the majority of the participants in the system. Authenticated information in the data blocks cannot be deleted (Michael et al. 2015). A blockchain is a digital system built from intelligent algorithms and data to execute and record transactions. The system is protected by encryption and is used by various industries and governments to gain market advantage (Justinia, 2019). Blockchain is built on trust, which allows us to avoid the third- party trust issues currently provided by banks, lawyers, and other organizations. The blockchain has a distributed network that allows for secure and transparent data management and makes transactions more efficient for industries. In recent years, blockchain has been ranked among the top 10 strategic technology trends (Panetta, 2018).

Presence of a blockchain

Blockchain technology can be applied in many areas and can have a significant impact on businesses. Table 1 shows a summary of these areas globally, based on the Forbes (2020) blockchain-50 report, which includes companies with annual revenues of $1 billion using blockchain technology. In the report there are big companies from the US, Europe and Asia, but the technology is led by the United States.

The benefits of using blockchain technology in different areas:

Its use in different areas has many advantages. In the case of supply chains, blockchain enables full traceability of products and services, making the process more transparent and secure, and reducing costs and risks. In the area of data management, blockchain-based systems enable secure and efficient data management by sharing data between the appropriate parties, while ensuring data security and real-time tracking. In financial services, blockchain enables secure, reliable and fast

transactions without the need to transfer data, and reduces the cost and time of transactions. In healthcare, blockchain technology enables the secure storage and sharing of healthcare data, improving the quality of patient care. In public services, blockchain enables the registration and accessibility of important documents such as birth and marriage certificates, simplifying administration (William M, 2016). For businesses, private blockchain solutions can be important, making internal transactions and data management more secure and efficient. Private blockchains operate with a limited number of participants, ensuring the security of transactions and data and enabling faster processes. However, building and maintaining the system can be costly and requires considerable expertise. In addition, the legal framework is not yet fully developed and can pose legal risks for businesses (Jai et al. 2019).

Nakamoto (2009) delineates blockchain as a decentralized ledger that aggregates transactions verified through cryptographic digital signatures and consolidated into blocks. The primary merits of blockchain (BC) encompass:

- Decentralization: Within the blockchain framework, transactions are ratified by a distributed network functioning through consensus algorithms, obviating the requirement for a central authority to uphold data coherence.
- Durability: The system undertakes the validation of transactions while concurrently seeking to affirm those that deviate, promptly identifying the outcomes of the transactions.
- Anonymity: Users within the network are endowed with a generated address (hash) granting them the authorization to facilitate transactions.
- Auditability: Every transaction maintains a relational attribute to preceding transactions, thereby facilitating the scrutiny of the data manipulated.
- Transparency: In the context of public networks, transactions stemming from any registered address within the network remain accessible for user perusal.
- Security: The blockchain architecture is constructed as shared and resistant to falsification.
- Immutability: Alterations to the data contained within the BC remain unfeasible; each ledger entry necessitates network endorsement. Moreover, every block retains the hash of its predecessor, ensuring any modification attempts are met with rejection.

By offering such a detailed representation of blockchain's attributes, Nakamoto underscores the transformative potential this technology holds, characterized by its secure, transparent, and immutable nature.

Data management

Blockchain technology is revolutionising the way businesses operate, enabling more efficient and secure data management, which is key to HR. Retrieved from managing and sharing employees' personal data with enormous responsibility. A blockchain is a decentralised database that operates across a network of computers. The data stored in the blockchain is divided into several blocks, each containing information related to the previous block. The blocks are linked organically and together form the blockchain, allowing data to be stored and shared securely. The stored data is encrypted so that only those with access to the appropriate keys can access it. In addition, the technology allows transactions to be tracked and authenticated, thus minimising the possibility of fraud (Candice, 2022).

Businesses can easily store and share employee data, including personal information, job performance and benefits. Employee data can be block chained and only those with the right access can access this data. Another benefit is that it minimizes the number of intermediaries. In traditional HR systems, communication between businesses and employees often requires intermediaries to access the data. Technology allows the elimination of intermediaries, so that businesses and employees can communicate directly (Sakho et al. 2019).

Effective data management allows you to monitor the work of your employees and evaluate their performance. It also enables automatic tracking and payment of employee performance and benefits, minimising the potential for errors in workforce management. It can also help automate complex processes. For example, companies can store employee data sheets in the blockchain and employees can use this information to automatically apply for new positions or training. Another benefit of blockchain technology is that it helps businesses improve their communication with customers. Through blockchain technology, businesses will be able to manage customer data more efficiently and securely, improving the customer experience and contributing to the long-term success of the business (Mishra and Venkatesan, 2021).

In summary, blockchain technology offers businesses greater security and efficiency in the area of HR. Employee data can be securely stored and shared on blockchain, minimising the potential for fraud and reducing the number of intermediaries. Blockchain technology enables the automation of complex processes, improves the customer experience and contributes to the long-term success of the business. The use of blockchain technology in HR could be the key to business success in the future.

Financial transactions

The technology can be used not only for storing and sharing data, but also in many other areas, such as managing financial transactions and automating the payment process. Financial transaction management and payment automation play a key role in the lives of businesses. Traditional payment systems can be time-consuming and expensive, while the use of blockchain technology can make the management of such transactions much more efficient and cost-effective (Tucker and Catalini, 2018).

Allows data to be stored and shared securely, as data is stored in multiple independent blocks that are not linked through a single central point can be traced back simply to. This prevents data manipulation and unauthorised modification of transactions. For businesses, it also means more efficient management of employee wages and benefits. With blockchain technology, businesses can easily manage the pay-

ment of wages and benefits as the payment process is fully automated. For employees, this means that they receive their salaries accurately and on time. Using technology to manage financial transactions and payments can also bring additional benefits. Technology allows for the fast and efficient handling of transactions between different currencies, as well as the automation of complex financial transactions. In addition, blockchain technology can also help manage taxation and financial reporting, which can help businesses meet their tax and accounting obligations (William, 2016).

Workflows

Blockchain technology is revolutionising the world of business. Originally behind cryptocurrencies, the technology can now be used in many areas, including business processes. Blockchain enables businesses to create more efficient workflows that can improve productivity and reduce costs (Jai et al, 2019).

The benefits of the technology also include more efficient management and optimisation of workflows. Businesses can easily manage employee schedules and track their work. Employees' activities can be recorded in blocks and these blocks can be added to the blockchain along with time stamps. This approach makes it easier to track data and monitor employee work. In addition to managing employee schedules, blockchain technology can also help businesses optimise workflow. Through blockchain, it is easy to track the production process, parts procurement and sales. By analysing data faster and more efficiently, businesses can identify problem areas and react to problems in a timely manner. Its use not only leads to more efficient workflows and increased productivity, but also helps to reduce costs. The transparency and reliability of the data reduces administrative costs, as businesses can easily access the data without the need for multiple checks and adjustments. In addition, blockchain technology helps businesses to reduce transaction fees as the role of central authorities and intermediaries is minimised. The benefits of blockchain technology also include data security. The data stored by blockchain cannot be modified or falsified, as all transactions must be confirmed by consensus of the participants. This prevents phishing, forgery and fraud (Fachrunnisa and Hussain, 2020).

Most popular uses in Human Resources

The use of blockchain technology is gaining momentum in various fields. Blockchain technology offers significant benefits to businesses in the areas of HR, management and organisation. The technology helps in more efficient data management, financial transaction management and workflow optimisation, all of which contribute to increasing business efficiency (Mishra and Venkatesan, 2021).

1. Payroll: Payroll is one area where blockchain can simplify and secure the payment of employees, contractors and suppliers. This is particularly useful for cross-border payments where traditional electronic payment methods may not work due to local regulations and IT security systems. Large payroll providers, such as ADP, are also developing blockchain applications for this purpose (Dina et al. 2020).
2. Recruitment: Candidates can tokenise their identity and provide virtual credentials such as transcripts, training certificates, CVs and work histories that recruiters and HR managers can trust have not been manipulated. This can significantly reduce the workload associated with retrieving and securely transmitting documentation. Blockchain verification can also reduce the cost of background checks and verification (Koncheva et al. 2019).
3. Employee decentralized data management: Personal data can also be encrypted and securely stored on the blockchain, providing immutability and a secure management system. However, experts suggest that it is more realistic to use the blockchain as a database to capture data on future employees, rather than as a trusted repository of past information (Damle and Kulkarni, 2023).
4. Smart contract: Finally, smart contracts enabled by blockchain can transform paper contracts into immutable, transparent digital contracts. Employers can use them to enforce the terms and penalties set out in agreements with employees and contractors (Pinna and Ibba, 2019).
    - Automated Agreements: Smart contracts facilitate automatic execution of contracts once predetermined conditions are met, saving time and reducing disputes.
    - Performance-Based Rewards: Smart contracts can be used to automate performance-based rewards and incentives (Coita et al. 2019).
5. Verification of Employee Credentials
    - Swift Verification: Blockchain allows for the quicker and more secure verification of potential employee credentials, including their education and work experience.
    - Fraud Prevention: By securing data on a decentralized ledger, it reduces the possibilities of fraud and misrepresentation.
    - Transparency: Employees can have a clear and immutable record of their compensation, including bonuses and other incentives (Mukherjee et al. 2022).

Overall, blockchain technology enables businesses to create more efficient workflows that can improve productivity and reduce costs. By managing employee schedules and analysing data more effectively, businesses can more easily identify problem areas and respond to issues in a timely manner. Data security and transparency are additional benefits that blockchain technology offers businesses. As a result, more and more businesses - primarily large enterprises (Forbes, 2020) - are choosing blockchain technology to better manage their workflows and increase efficiency.

Limitations

Implementing blockchain technology in Human Resources Management (HRM) can bring about several advantages, such as increased security and transparency. Nevertheless, some constraints have to be taken into account. Herein are a few possible drawbacks of employing blockchain in HRM:

1. Technical Challenges: Blockchains are complex technologies that require deep understanding for effective implementation. Privacy concerns and legal and regulatory hurdles remain critical barriers to the effective use of blockchain technology. Integrating these technologies with existing HR systems presents significant challenges due to technical hurdles and compatibility issues (Abu and MD, 2022).
2. Privacy concerns: Legal and regulatory hurdles remain critical barriers to the effective use of blockchain technology. Storing employee data on a blockchain may result in privacy issues as it is unchangeable once recorded. In terms of compliance with data protection laws, legal and regulatory hurdles can arise (Fachrunnisa and Hussain, 2020).
3. Energy issues: Additionally, the high energy consumption required for blockchain technology may prove to be resource intensive. Blockchain networks, particularly those employing proof-of-work algorithms, consume a noteworthy amount of energy. The establishment and maintenance of a blockchain infrastructure can prove to be expensive, requiring investments in technology and expertise (Wang et al. 2017).
4. Adoption concern: There may exist cultural and adoption resistance. Employees and stakeholders may be hesitant to embrace a new technology owing to unfamiliarity or scepticism. Companies need to allocate resources to training employees to operate the new system, which could be time-consuming. Additionally, procuring the appropriate expertise poses a significant challenge due to the scarcity of skilled professionals required for implementing and managing blockchain systems (Mishra and Venkatesan, 2021).
5. Scalability: The limited scalability of blockchain networks can hinder their widespread adoption. Transaction speed limitations can be observed on blockchain networks, which can impede large organizations. Furthermore, blockchain demands substantial data storage capacity, causing a challenge for HR databases with significant size (Kartik, 2018).

Table 2: Comparison: Centralized HRM and Decentralized HRM

	Centralized	Blockchain Based
Data	is hosted in a centralized server.	is hosted on a decentralized blockchain.
Signatures	Digital signatures are necessary.	Private key is needed to access database.
Compatibility	Incompatible to work various modules simultaneously.	Large number of modules can cross-talk.
Monetization	Not possible	Monetization of data can be monetized (cryptocurrency).
Tampering	Possible	Almost impossible, in case of successful, will be know by the blockchain.

Source: Based on Kartik (2018) and Candy (2020).

CONCLUSION

In conclusion, blockchain technology is increasingly being adopted in the field of human resources, where it shows great potential in optimizing and securing various HR processes, including payroll management, recruitment, and employee data management. Leveraging the immutability and transparency features of blockchain can streamline workflows, enhance data security, and reduce fraudulent activities, potentially revolutionizing the HR landscape. Moreover, smart contracts, a byproduct of blockchain, can transform traditional contracts into digital agreements, automating various aspects and enhancing efficiency in enforcing terms and agreements. However, this emerging technology brings forth considerable challenges such as integration complexities, privacy concerns, high energy consumption, and scalability issues, which require thoughtful consideration and strategic planning before implementation. As businesses, predominantly large enterprises, are navigating these challenges to incorporate blockchain technology, it is pertinent to equip HR professionals with the necessary knowledge and skills to adapt to this evolving landscape effectively. While promising, it demands a careful approach to integration, balancing the remarkable benefits with the existing hurdles to foster a more efficient, secure, and transparent HR environment.

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