Making quality certifications effective for SMEs

Opportunities in the agri-food field amongst perceptions, experiences and evidences

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Introduction

This research analysed the consistency of business decisions to propose a more efficient way of doing business.

First of all, the study assessed the **compliance** of companies with **legal requirements** and the specifications of **voluntary standards**.

In addition, it analysed the degree of management awareness about the **management**, **production** and **economic choices** made.

Finally, this study will be beneficial for SMEs who want to know the current global business landscape and want **to qualify** their **quality management system** and their products in order to obtain quality certification.

“ Come, give us a taste of your quality ”

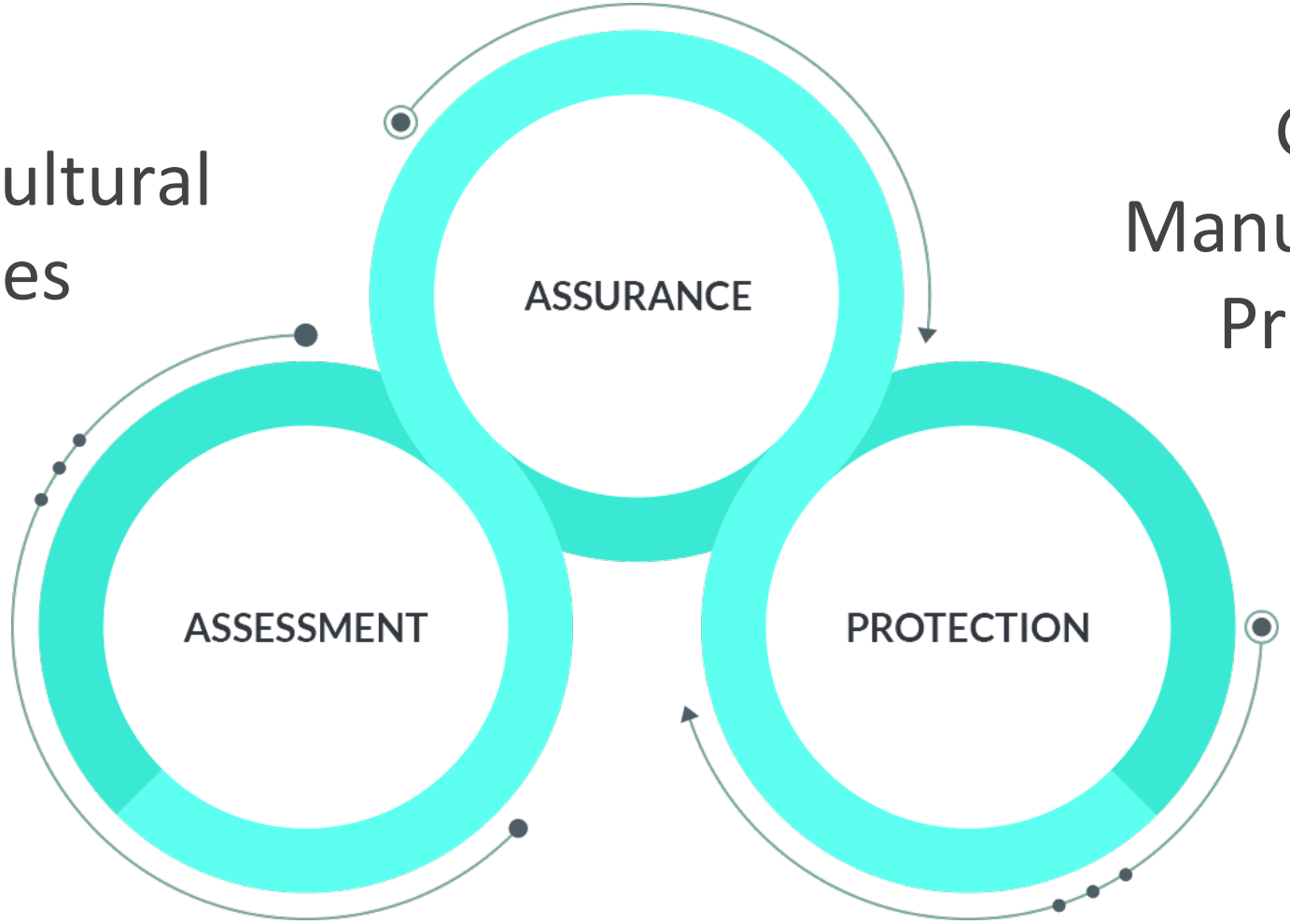
William Shakespeare, Hamlet (1602)

Quality assessment

Fundamentals for food quality

Good Agricultural Practices

Good Manufacturing Practices



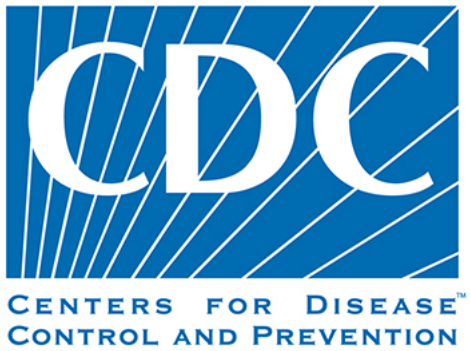
Good Hygiene Practices

HACCP* / HARPC**

* Hazard Analysis and Critical Control Point

** Hazard Analysis and Risk-based Preventive Controls for human food

Food surveillance system

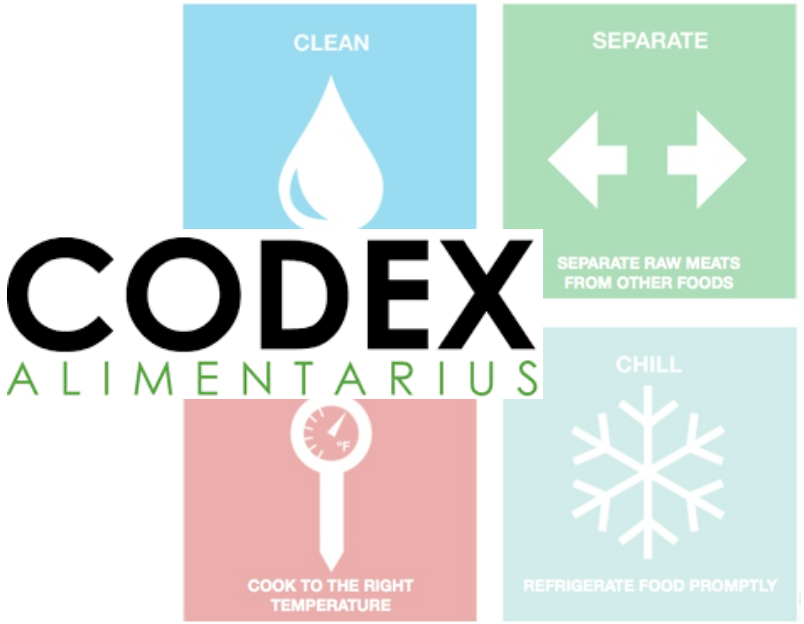


Global trade and food safety

Hazard Analysis
Critical Control Point Identification
Establishment of Critical Limits
Processes for Monitoring
Corrective Actions
Record Keeping
Establishment of Verification Procedures

WORLD TRADE ORGANIZATION

International Trade Centre



Main certification schemes

Regulated European certifications
ORGANIC
POD PGI TSG

Voluntary system certifications
ISO 9001 ISO 14001
ISO 45001 ISO 22000
FSSC 22000

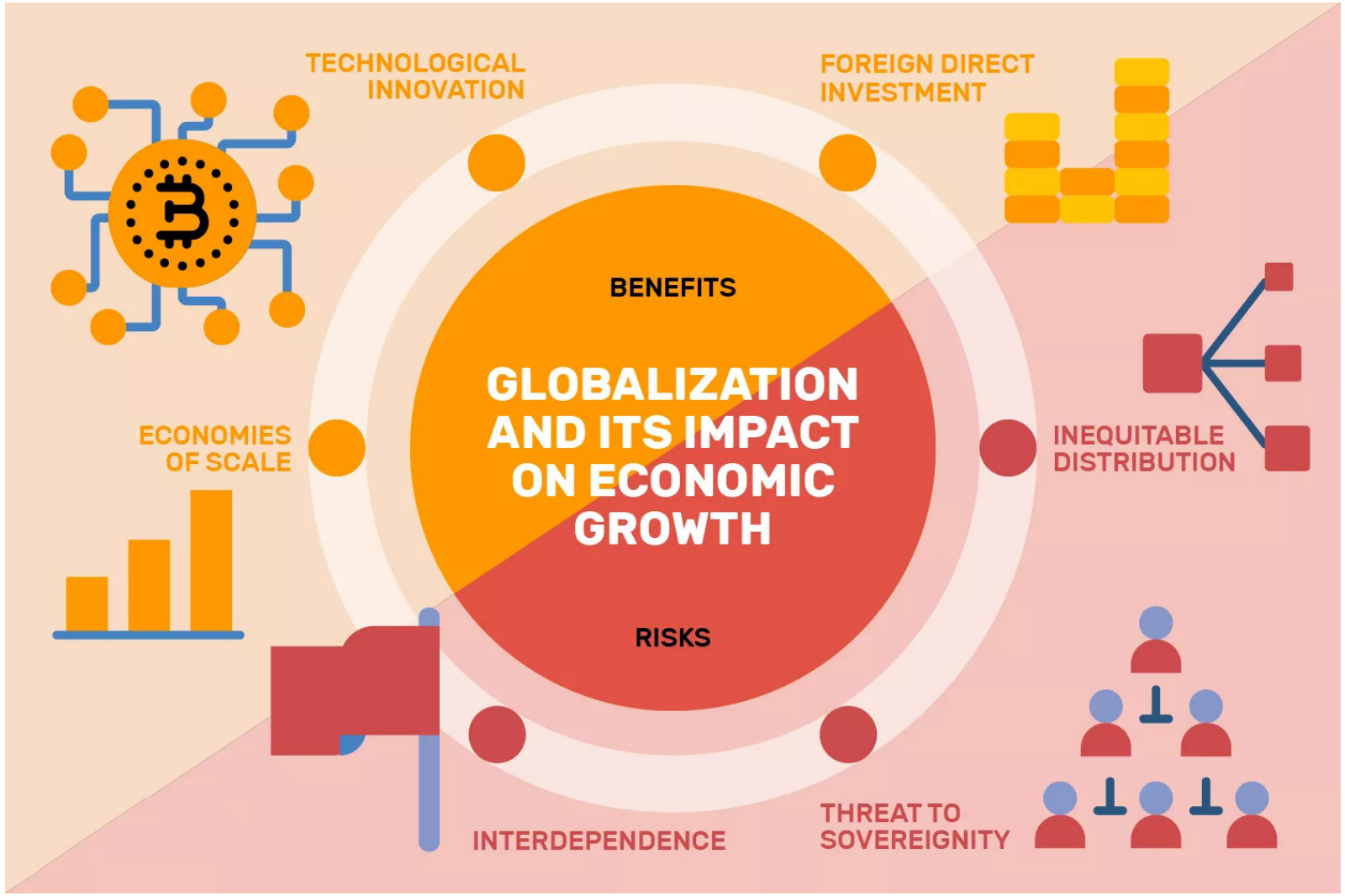
Voluntary process certifications
ISO 22005
Non – GMO
UNI 11233

Voluntary product certifications
IFS
BRC
GlobalGAP

Some schemes of standards abroad
FSMA, FDA US Food Safety Modernization Act
FSANZ, Food Standards Australia New Zealand

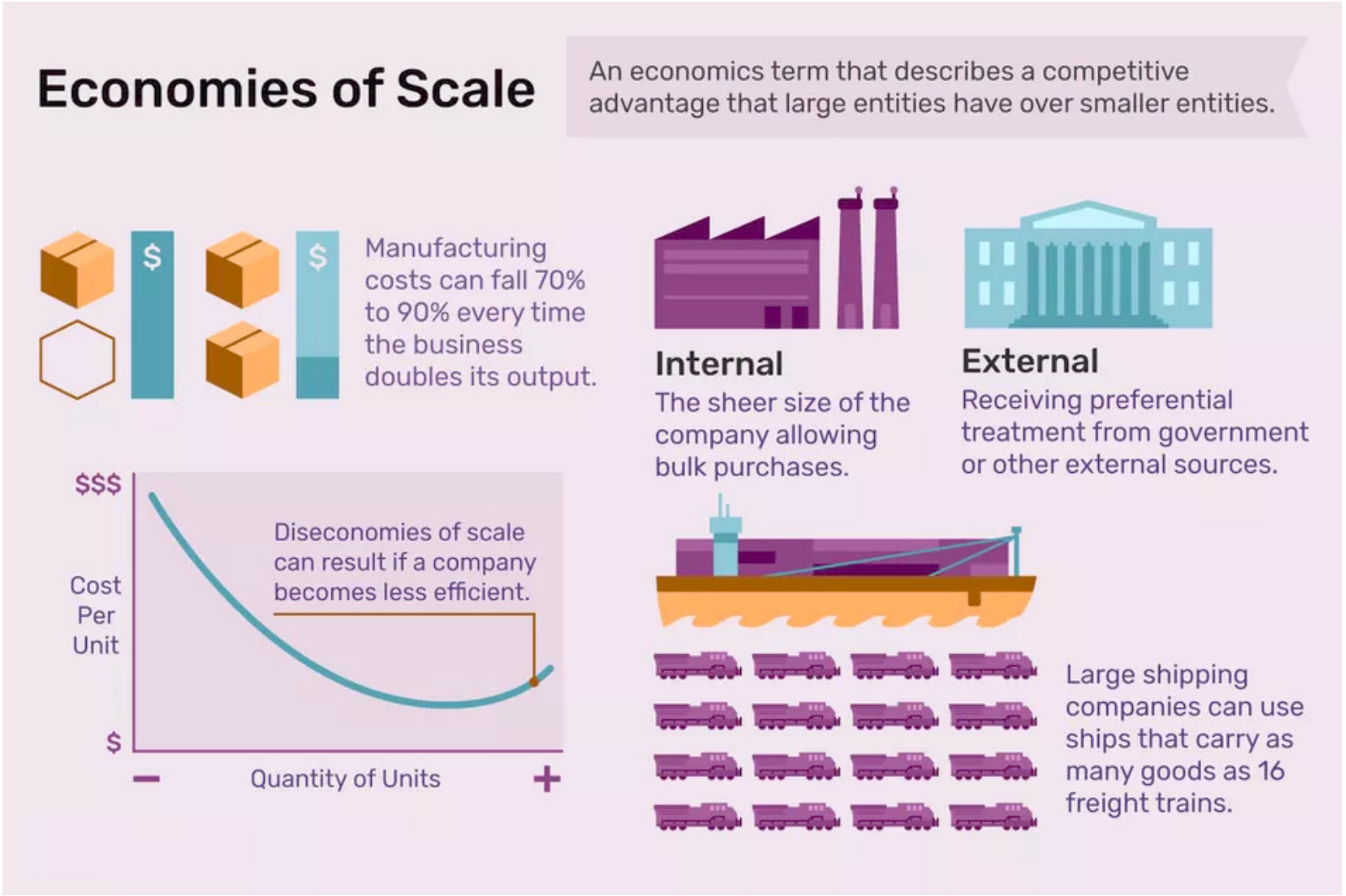
Religious certifications
HALAL
KASHRUT (Kosher foods)

Globalization



Source: https://www.thebalance.com/globalization-and-its-impact-on-economic-growth-1978843

Globalization: a look at a benefit



Source: https://www.thebalance.com/economies-of-scale-3305926

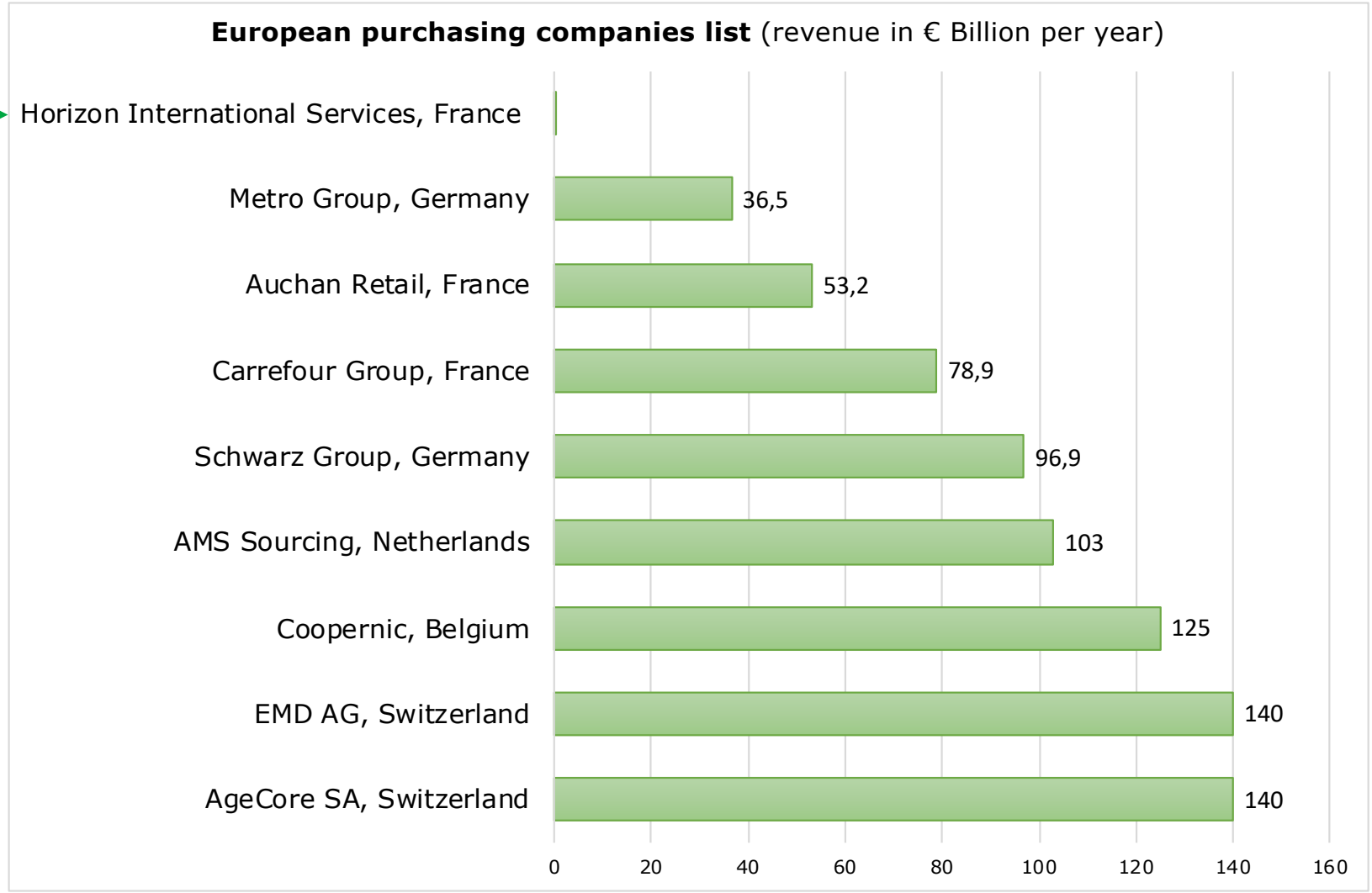
Accreditation

What are the potential benefits of harmonizing standards?

- COMMON EVALUATION METHODS
- COMMON PRODUCT CHARACTERISTICS DECLARATION
- NO OBSTACLES TO TRADE
- IMPROVED COMPETITIVENESS

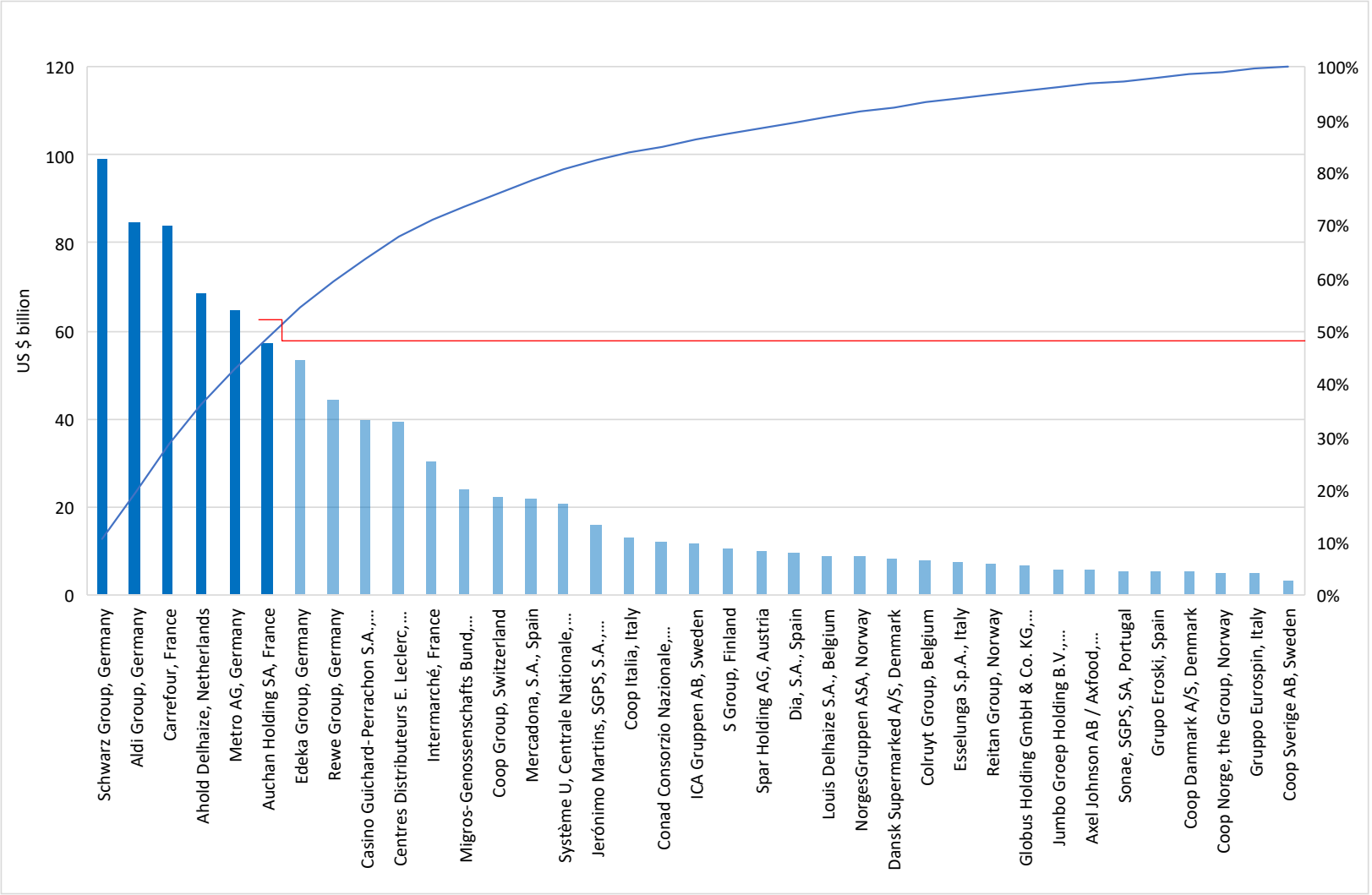
Group Purchasing Organizations

This is a new alliance between Auchan, Metro, Casino and Dia that operates since February 2019 so that the data currently collected are incomplete.



Food retailers

Please note that **the first 6** companies hold around **50%** of the European market.



Traceability

Source: https://www.gs1.org/standards/traceability

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Sustainability

Source: World Economic Forum https://www.weforum.org/

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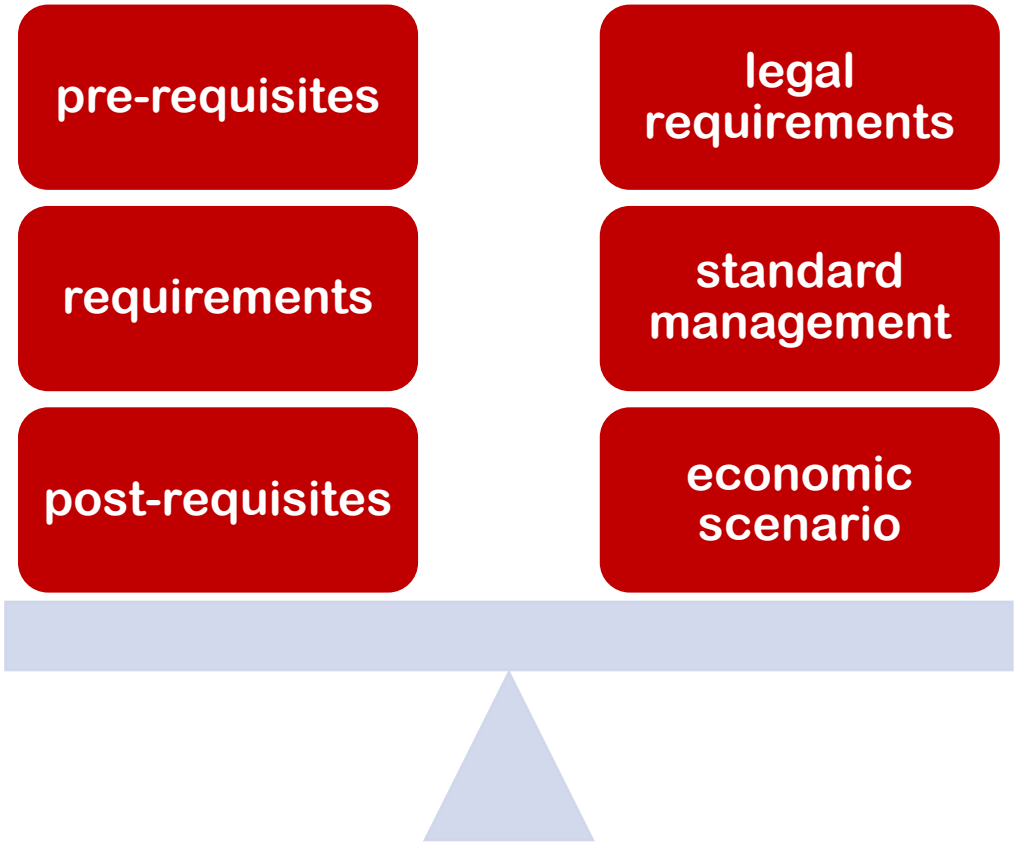
Purpose

Hypothesis

Does compliance with legal standards ensure compliance with voluntary standards?

Where is the fair balance between the requirements and their application?



Methods 1st business

Methodology concerning the Feed additives firm study

- ✓ **Fami-QS Code**

Good Hygiene Practices

Good Manufacturing Practices

HACCP plan

Integrated Management System Manual

- **Study participants**

Business / University working group composed by Tutor, PhD student, Master's degree student and company Management.

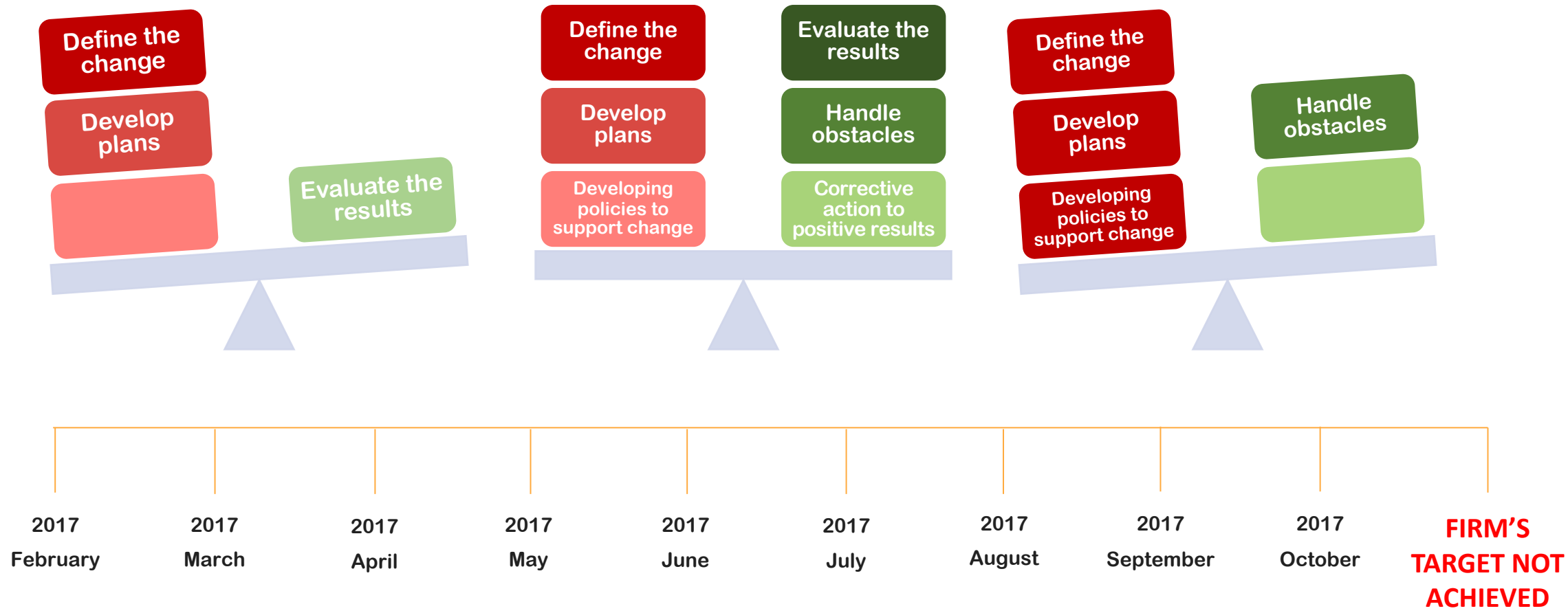
First and second Internal global audits on compliance with the FAMI-QS Code (sum of the weighted data)

	Point 4 of FAMI-QS Code	Point 5 of FAMI-QS Code	Point 6 of FAMI-QS Code	Point 7 of FAMI-QS Code	Point 8 of FAMI-QS Code	Point 9 of FAMI-QS Code	Point 10 of FAMI-QS Code
	MANAGEMENT SYSTEM	MANAGEMENT RESPONSIBILITY	RESOURCE MANAGEMENT	PRODUCT REALISATION	SYSTEM REVIEW	CONTROL OF NON-CONFORMING PRODUCTS	STATISTICAL TECHNIQUES
FEBRUARY 2017 AUDIT	-33	-39	11	-19	-24	-122	-9
OCTOBER 2017 AUDIT	-1	-29	25	-1	-22	-70	-1

t-test

	FEBRUARY 2017	OCTOBER 2017
Average	-8.392857143	-3.535714286
Variance	175.1362434	122.0357143
Remarks	28	28
Assumed difference for the averages	0	
degrees of freedom	52	
Stat t	**-1.490925628**	
P (T <= t) unilateral	0.071011336	
t unilateral critic	**1.674689154**	
P (T <= t) bilateral	0.142022671	
t bilateral critic	2.006646805	

Change management process



Statistical Analysis 1st business

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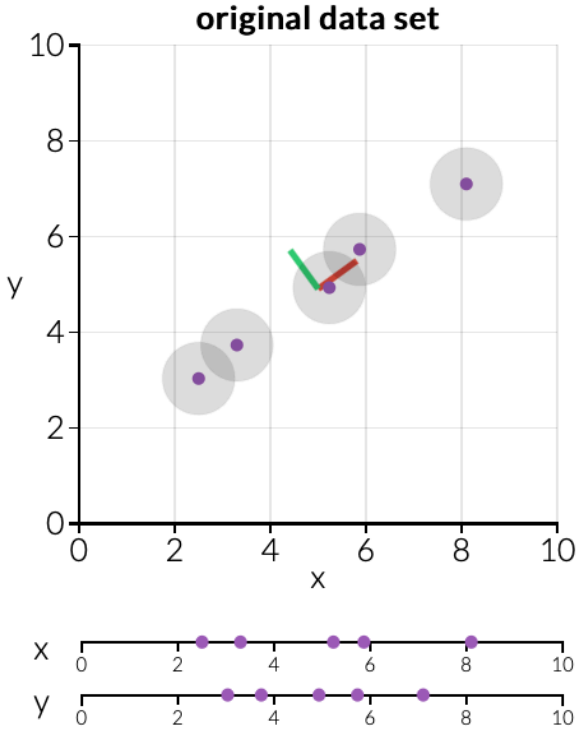
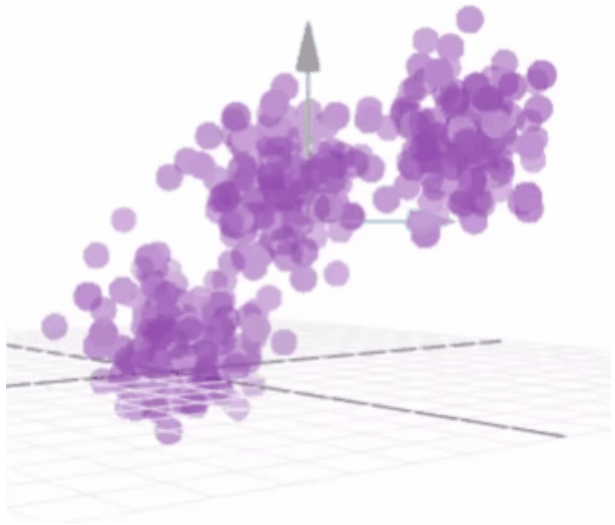
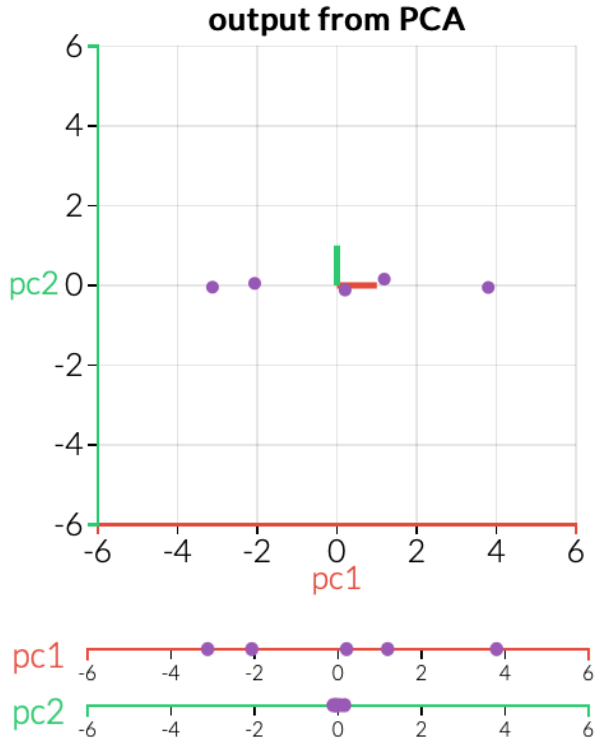
Principal component analysis (PCA) is a technique used to emphasize variation and bring out strong patterns in a dataset. It's often used to make data easy to explore and visualize.

1. If we want to tease out variation, PCA finds a new coordinate system in which every point has a new (x,y) value. The axes don't actually mean anything physical; they're combinations of parameters called "principal components" that are chosen to give one axes lots of variance.





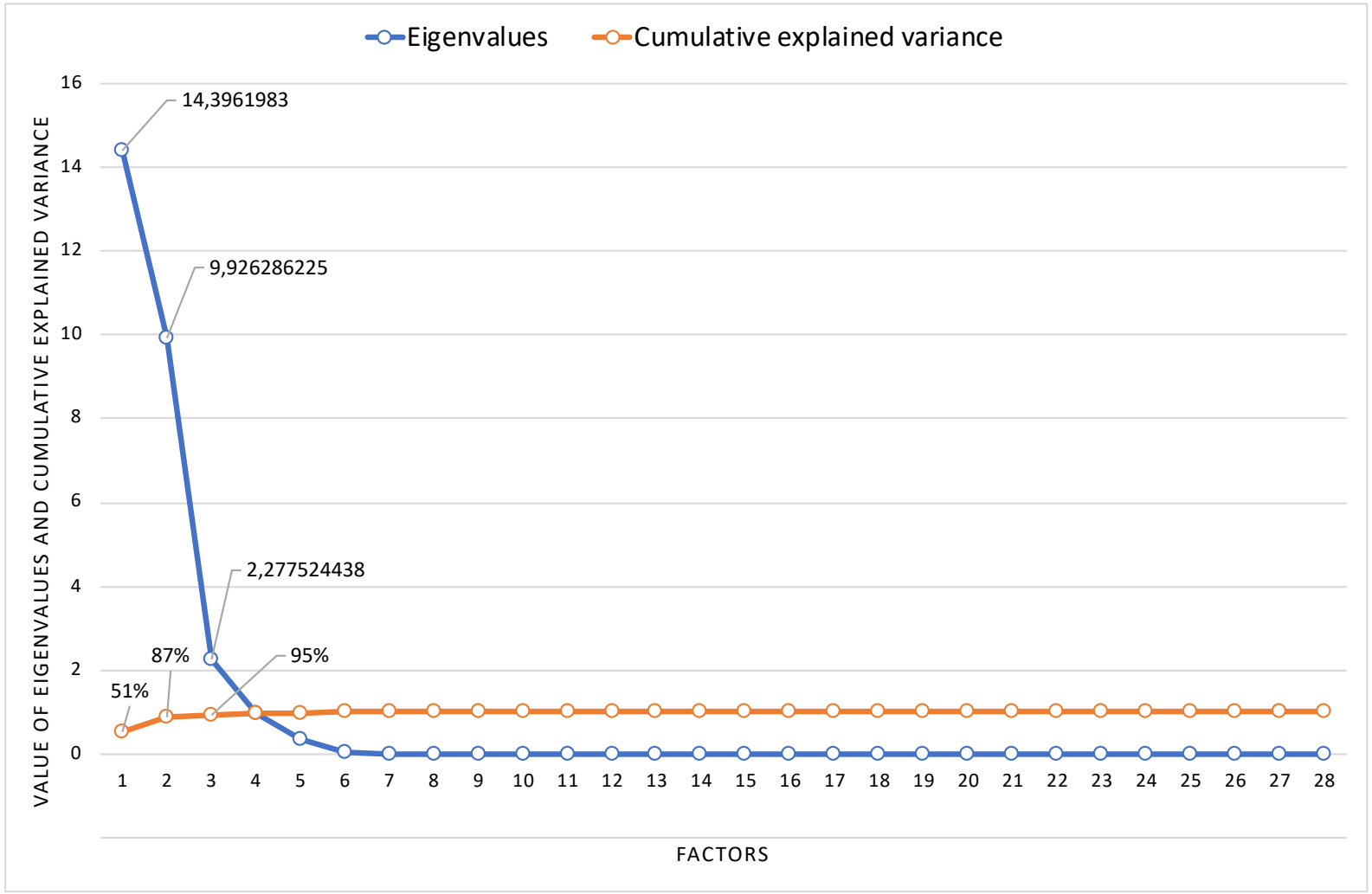


2. PCA is useful for eliminating dimensions. Above, we've plotted the data along a pair of lines: one composed of the x-values and another of the y-values.

3. If we're going to only see the data along one dimension, though, it might be better to make that dimension the principal component with most variance.

Results 1st business

On the basis of the analysis carried out, 2 of the 28 main factors are kept in the PCA since the first two eigenvalues* alone account for 87% of the variance.



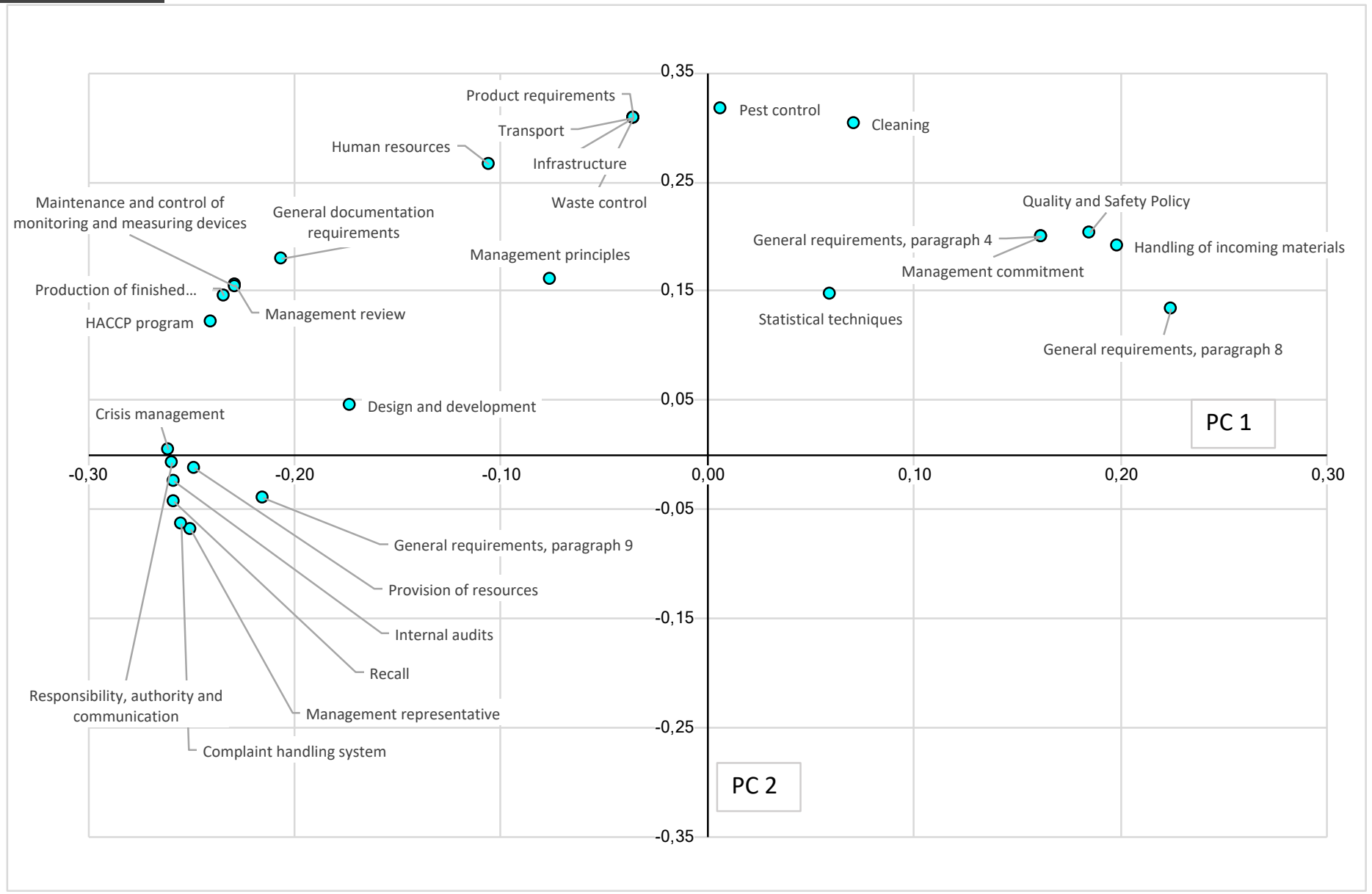
In this case, the coefficients of the eigenvectors constitute the regression coefficients for twenty-eight main components.

*Each eigenvalue includes the corresponding eigenvectors.

Discussion 1st business

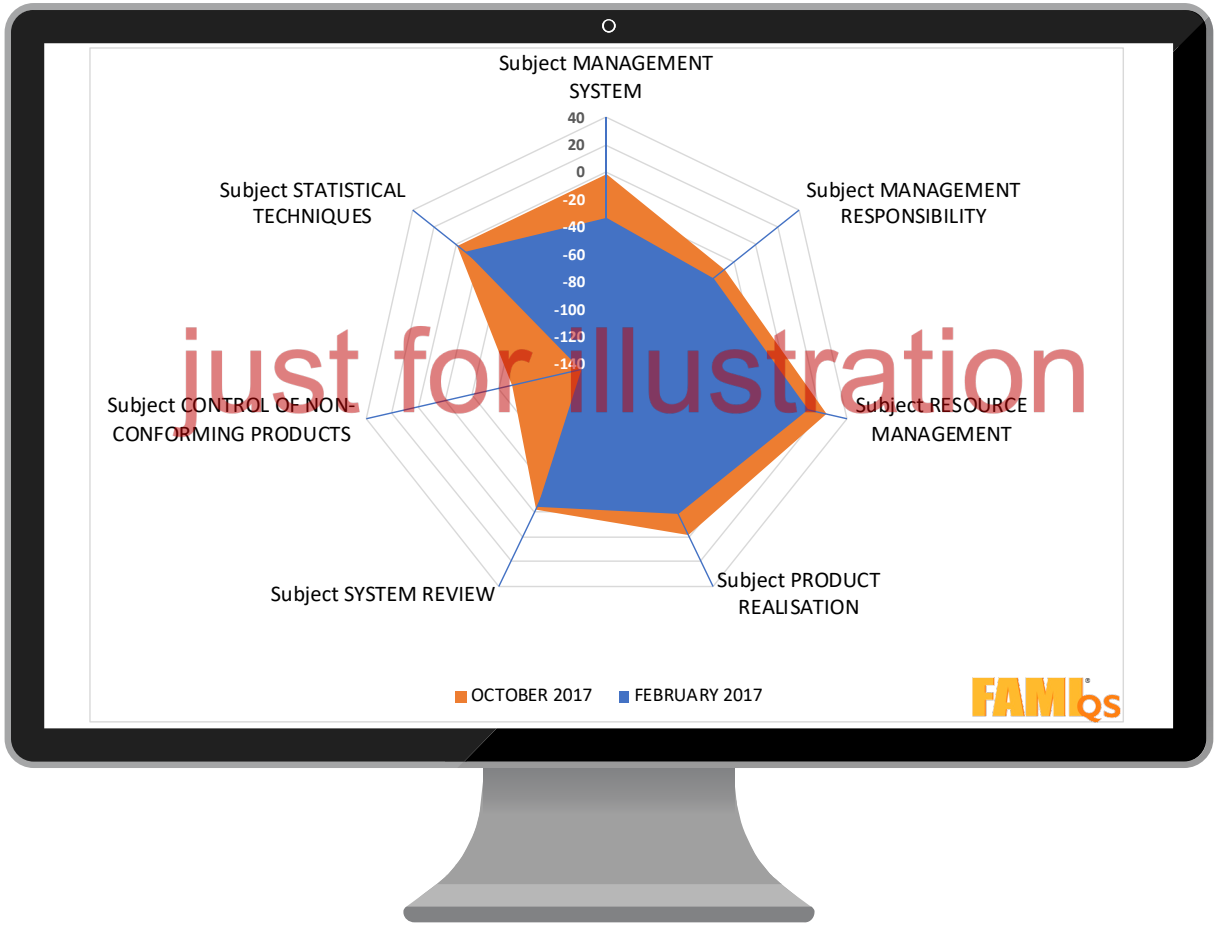
Loading plot on PC 1 and PC 2

Loading plot shows how strongly each characteristic influences every principal component



Conclusions #1

In the current context of global trade, the challenges that an organization faces in order to expand into the market are challenging, so that
constant and motivated implementation work is needed to achieve the goals



Methods 2nd business

Methodology concerning the Gluten-free beer firm study

- ✓ **Spiga Barrata label**

Good Hygiene Practices

HACCP plan

Brewers' Good Manufacturing Practices

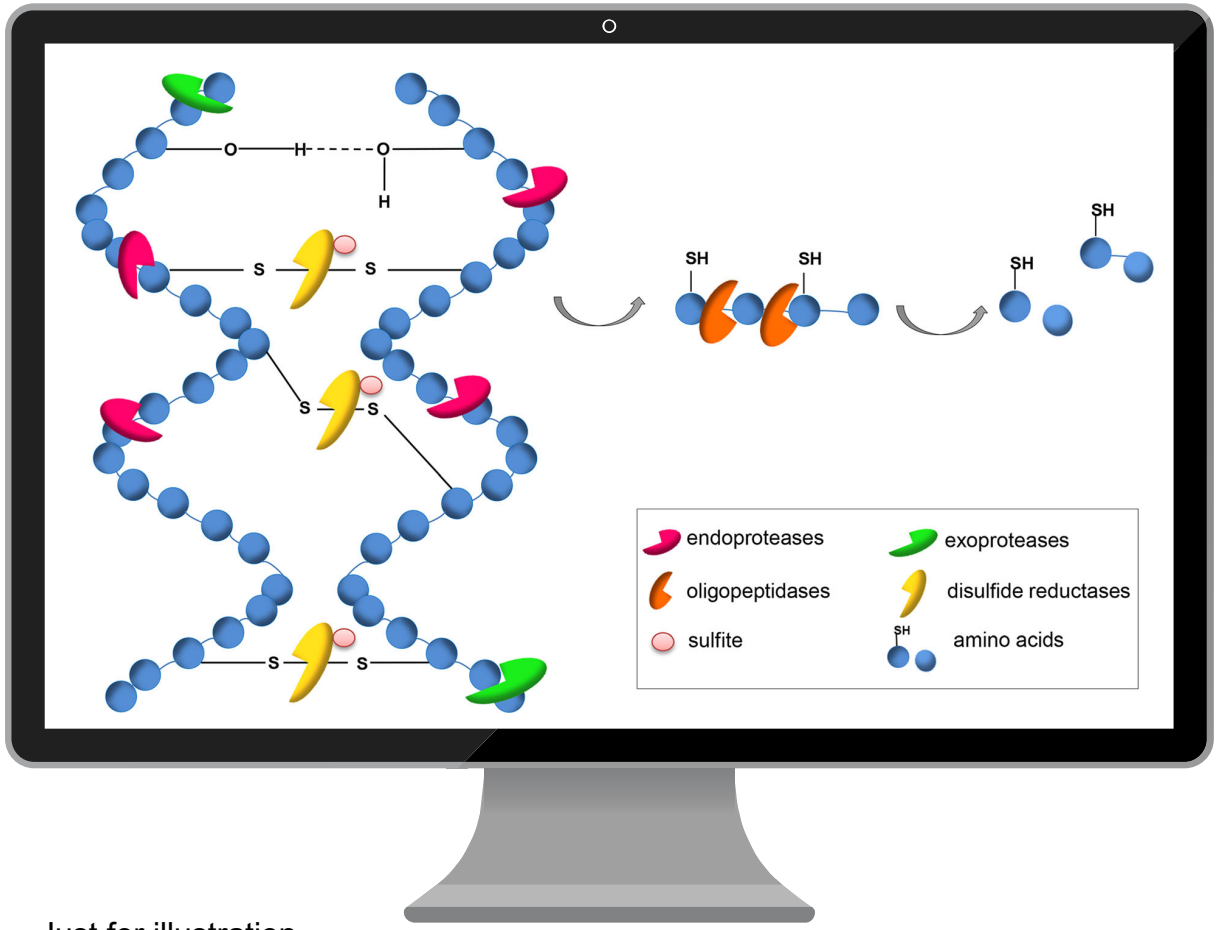
Cost-effectiveness of production

- **Study participants**

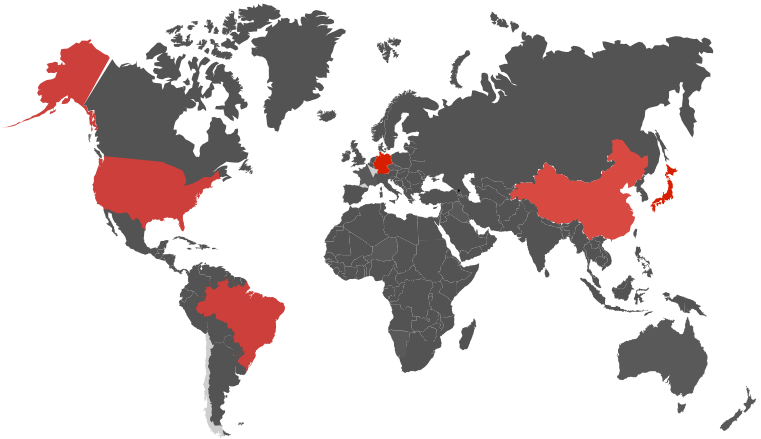
Business / University working group composed by Tutor, PhD student, Master's degree student and company Management.

Inspired by the Italian Law No. 123/2005 (Rules for the protection of people with celiac disease) the goal of company managers was to produce a beer with a gluten content < 20 ppm.

They used the enzyme Acid prolyl endopeptidase (EC 3.4.21.xx) from a genetically modified strain of *Aspergillus niger*, sold under the name Clarex.



Just for illustration.
Source: Lange, L., Huang, Y., & Kamp Busk, P. (2016). Microbial decomposition of keratin in nature, a new hypothesis of industrial relevance. Applied Microbiology and Biotechnology, 100(5), 2083–2096. https://doi.org/10.1007/s00253-015-7262-1



Value of retail beer sales

(US$ Billions)

Source: Canada Agriculture and Agri-Food Ministry, 2019

	2022 (estimate)	CAGR % 2018 – 2022*
USA	118	2,8
CHINA	122	7,5
BRAZIL	61	7,6
JAPAN	38	0,4
GERMANY	34	1,5
Global market	866	5,6

*CAGR represents the average percentage growth of an economic magnitude in a given period of time. The magnitude can be the turnover (or gross revenue) of a company, a stock, or the market of a product.

Audit summary on **good hygiene practices** based on the GHP checklist carried out at brewery in January 2018

	FULL CONFORMITY	MINOR NON-CONFORMITY	MAJOR NON-CONFORMITY	CRITICAL NON-CONFORMITY
TOTAL OF CRITERIA	39	12	10	4
TOTAL OF CRITERIA %	56,5%	17,4%	14,5%	11,6%

Audit summary on **hazard analysis** based on the HACCP checklist carried out at brewery in January 2018

	FULL CONFORMITY	MINOR NON-CONFORMITY	MAJOR NON-CONFORMITY	CRITICAL NON-CONFORMITY
TOTAL OF CRITERIA	23	14	14	3
TOTAL OF CRITERIA %	42,6%	25,9%	25,9%	5,6%

Audit summary on **good manufacturing practices** based on the GMP checklist* carried out at brewery in July 2018

	FULL CONFORMITY	NON-CONFORMITY
TOTAL OF CRITERIA	175	12
TOTAL OF CRITERIA %	93,6%	6,4%

*inspired to the Brewers Association for Small & Independent Craft Brewers checklist, 1327 Spruce Street, Boulder, CO 80302 USA, https://www.brewersassociation.org

Statistical Analysis 2nd business

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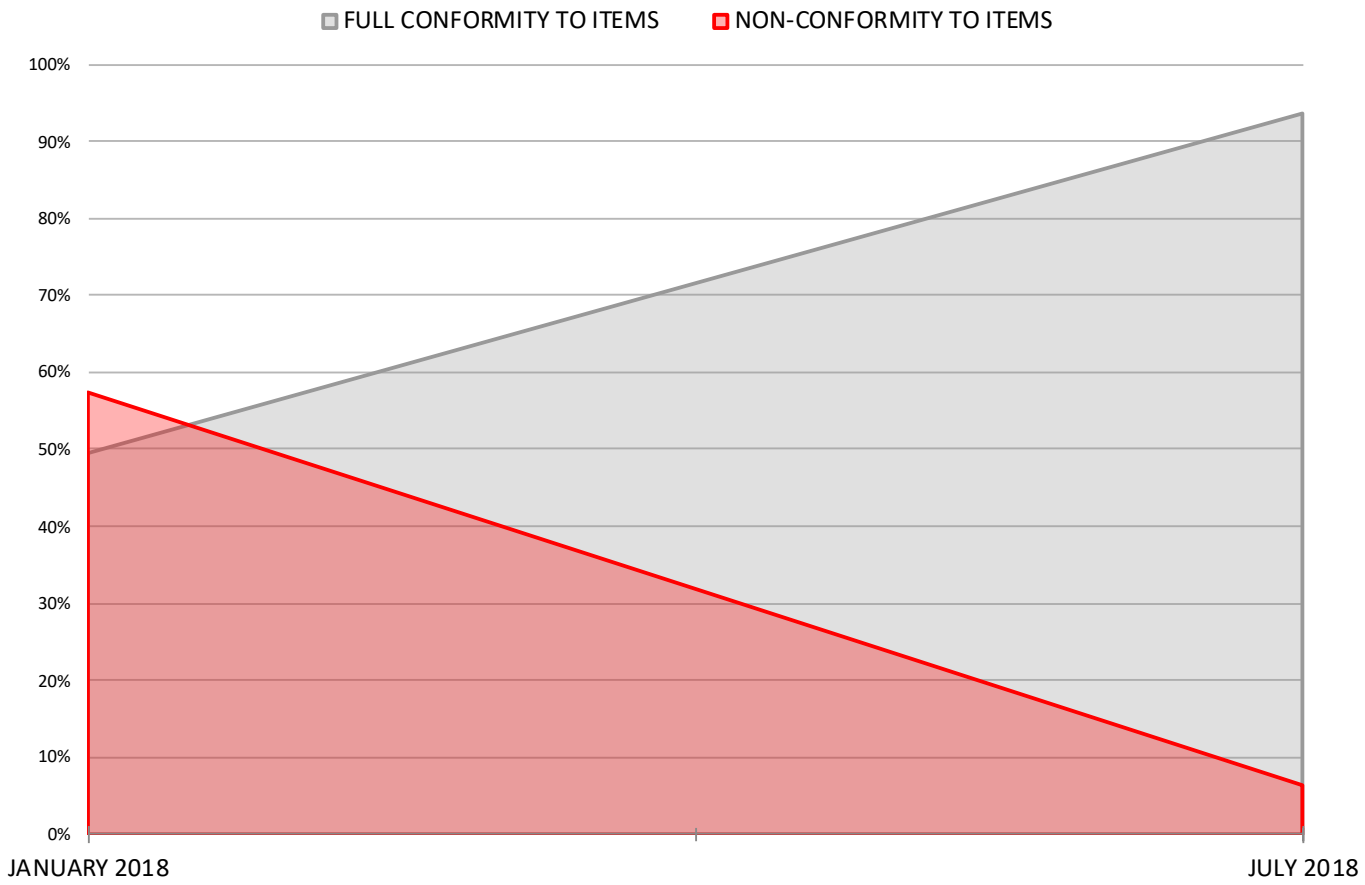
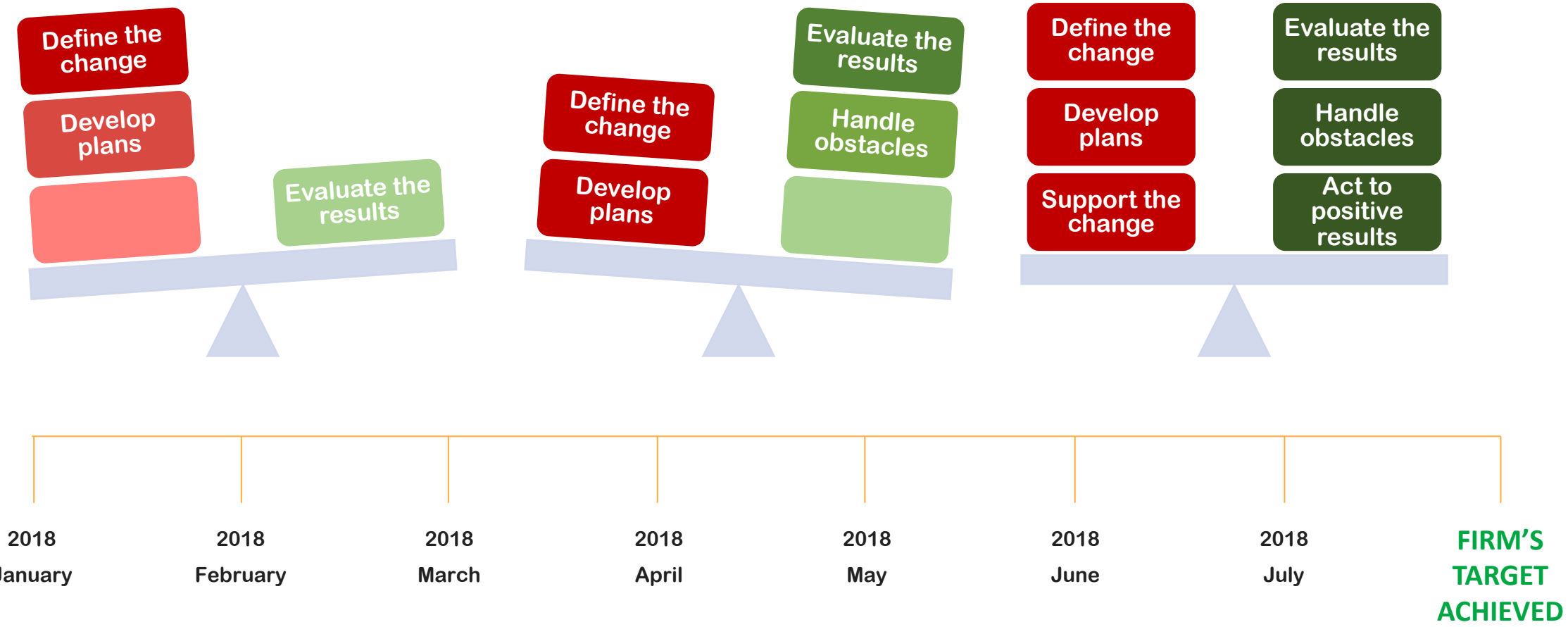
Audit summary on HACCP, GHP and GMP

	JANUARY 2018		JULY 2018
	HACCP	GHP	GMP
CONFORMITY	42,6 %	56,5 %	93,6 %
NON-CONFORMITY	57,4 %	43,5 %	6,4 %



Change management process



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Results 2nd business

Partial **balance sheet** of the business that lists the assets and liabilities at first half year 2018 and that illustrates the business's net worth

	Wort, expenses incurred in €	Beer, sales revenue in €	Profit in €	Must, cost in € / litre	Beer, revenue from sales in € / litre	Profit in € / litre
Regular beers	59,634.67	89,128.75	29,494.08	2.76	4.10	1.34
Gluten-free beers	4,536.80	6,762.40	2,225.60	2.65	3.95	1.30
Seasonal beers	15,712.15	23,189.20	7,477.05	2.66	3.91	1.25
Total	79,883.62	119,080.35	39,196.73			

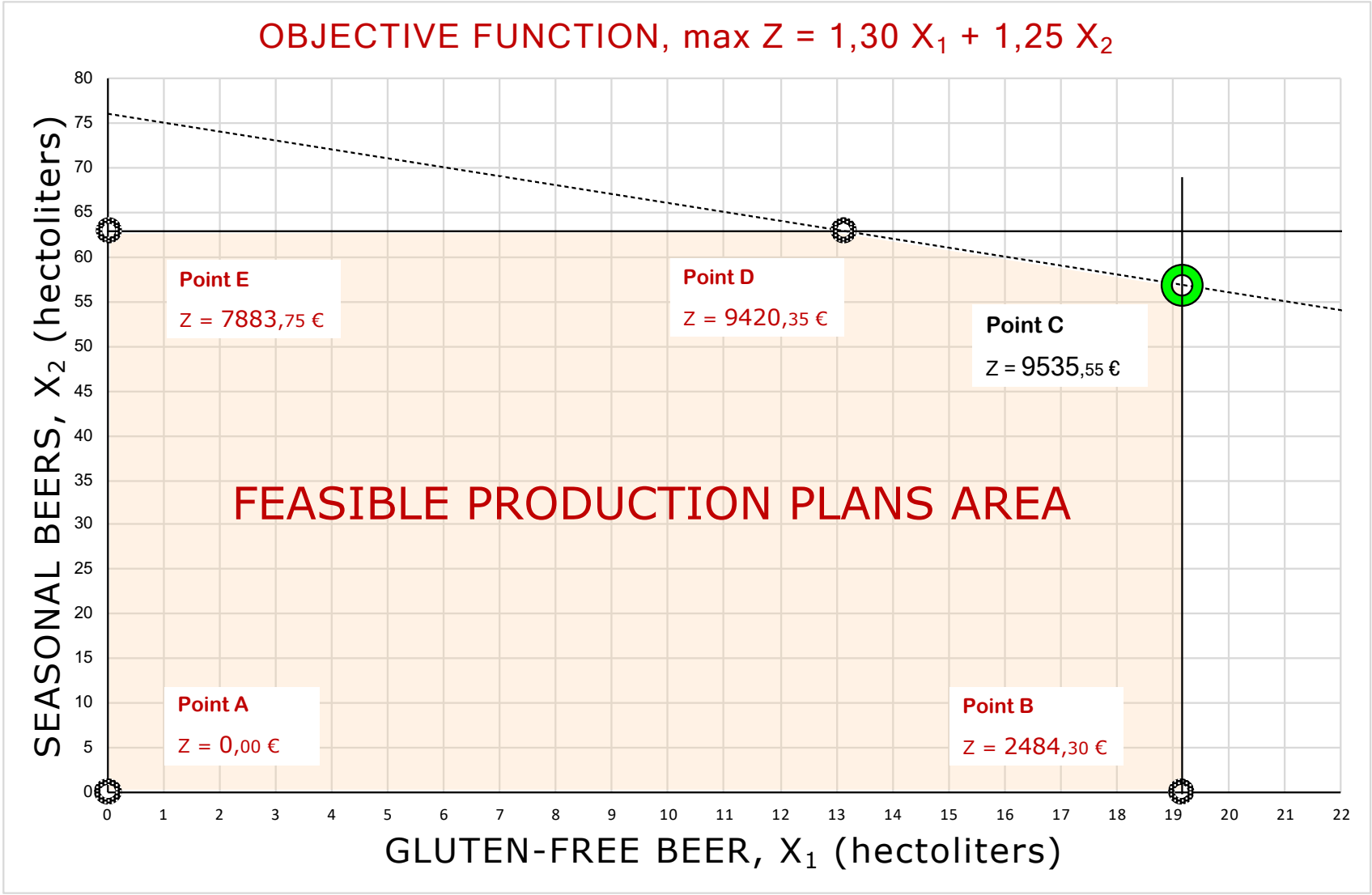
Production report of the business at first half year 2018 that illustrates the business's activity

	Wort, litres	Scrap, litres	Scrap %	Resulting beer, litres	Beer brewed by type%	Beer brewed, litres/die	Beer brewed, bottles/die
Regular beers	24,573	2,612	10.6	21,961	74.4	121	367
Gluten-free beers	1,911	199	10.4	1,712	5.8	9	28
Seasonal beers	6,307	467	7.4	5,840	19.8	32	97
Total	32,791	3,278		29,513		163	492

The aim is to produce in order to obtain the highest profit, *f(Z)*

FUNCTION CONSTRAINTS

SEASONAL BEERS PRODUCTION LIMIT	$X_2 < 63,07$
LIMIT OF GLOBAL PRODUCTION	$X_1 + X_2 < 75,52$
NON-NEGATIVE VALUES	$X_1 > 0$ $X_2 > 0$
GLUTEN-FREE BEER PRODUCTION LIMIT	$X_1 < 19,11$



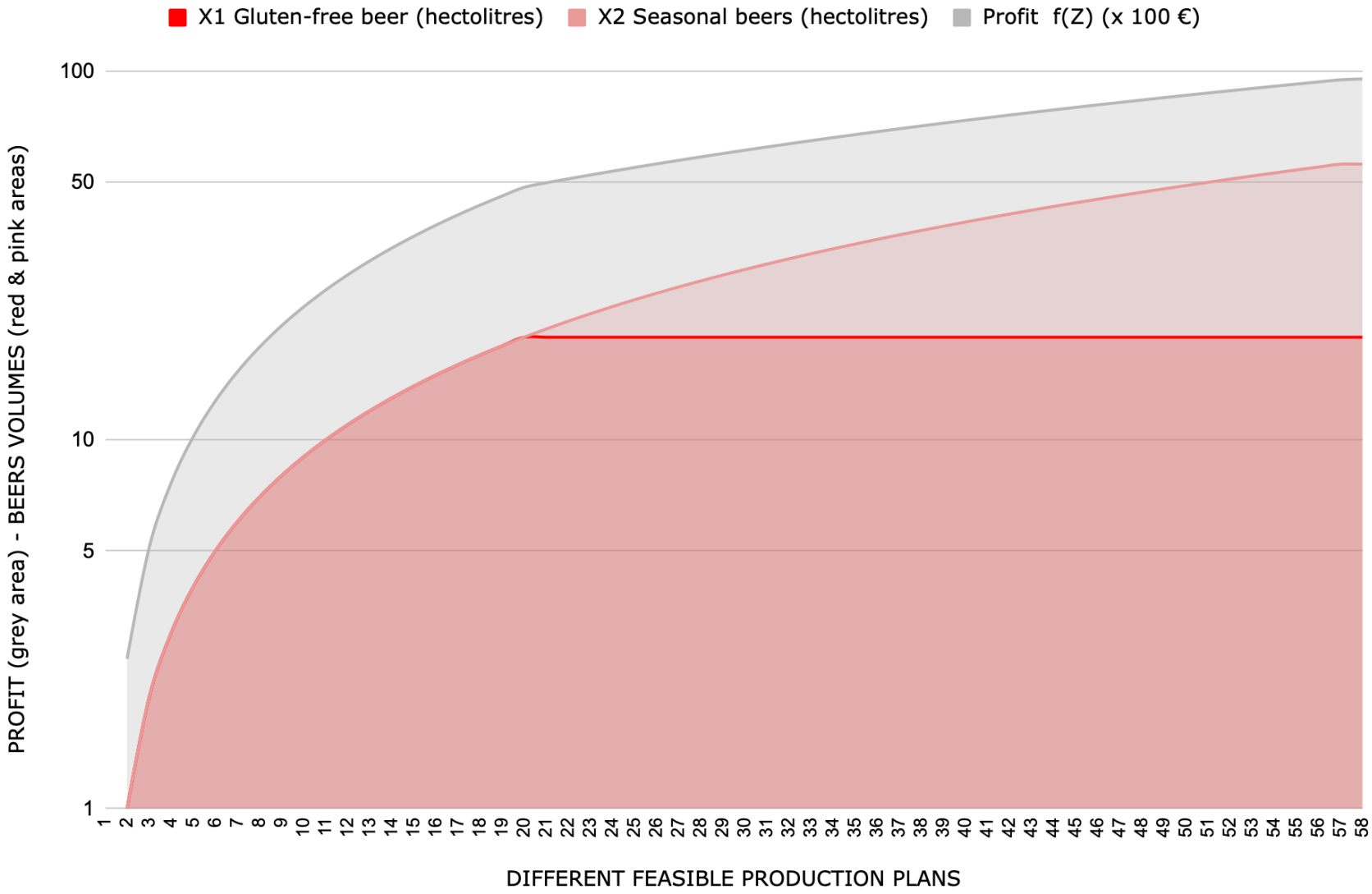
Discussion 2nd business

Production scenario

In this hypothetical production scenario, the half-year financial resources are dedicated for the production of seasonal beers and gluten-free beers only.

At the maximum point of the objective function and against a commitment of expenditure for a half-year of € 80,000, it is possible to obtain a gain in the period of approximately € 10,000 by combining the two productions appropriately.

In this scenario any other distribution of production allows a lower profit.

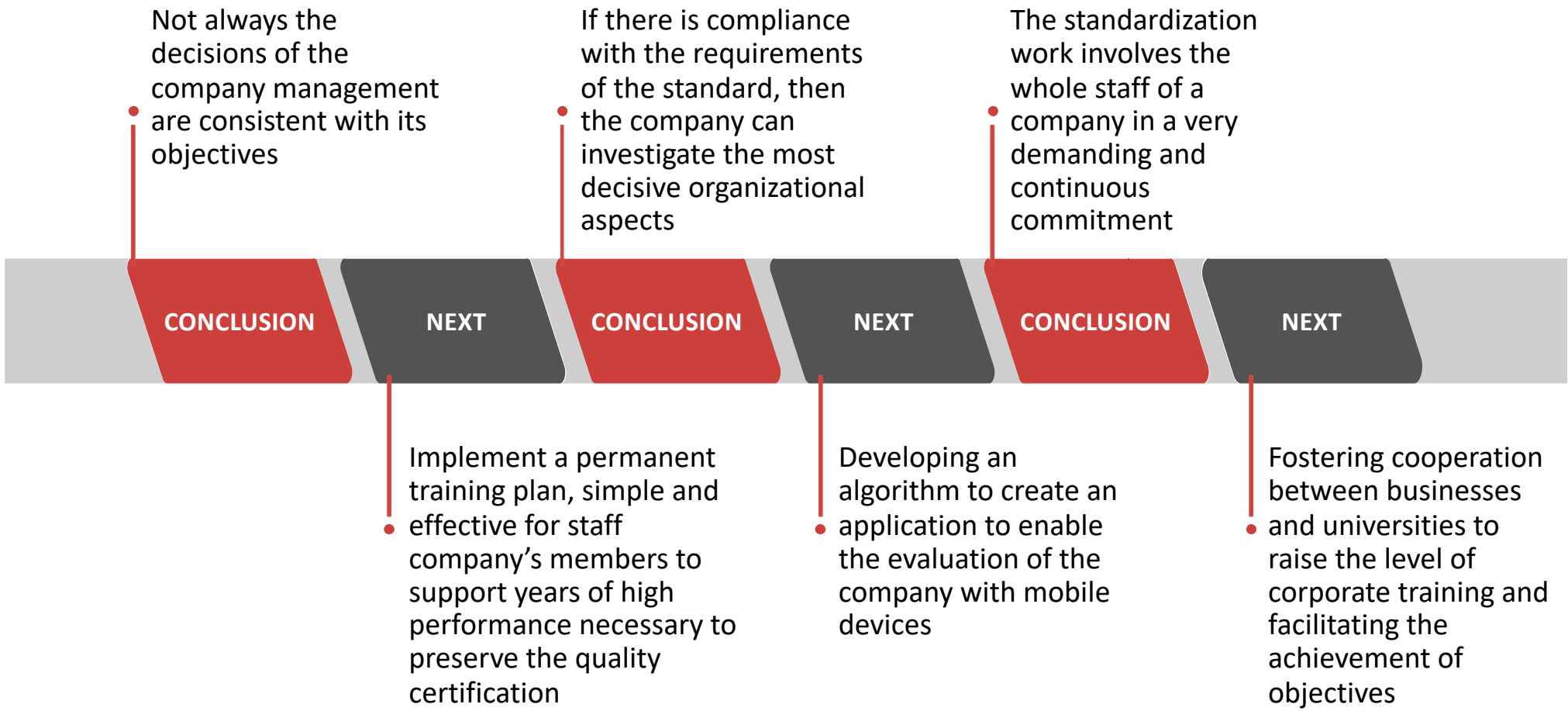


Conclusions #2

The legal basis for the industrial projects and implementing any measure needed to strengthen the economic base is the starting point to define new targets into products market.

The aim is to offer a beer derived from barley that has the flavour and aroma of the best craft beers but gluten-free.

Conclusions & Future Work



Thank You

Does anyone have any questions?

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