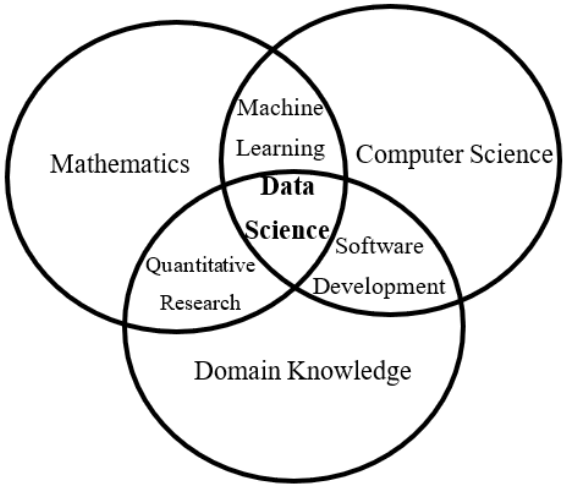
DATA SCIENCE

PROJECT DEVELOPMENT

Carlos J. Costa, ISEG

Context

- Data Science includes techniques developed in some traditional fields like artificial intelligence, statistics or machine learning.



Aparicio et al. (2019).

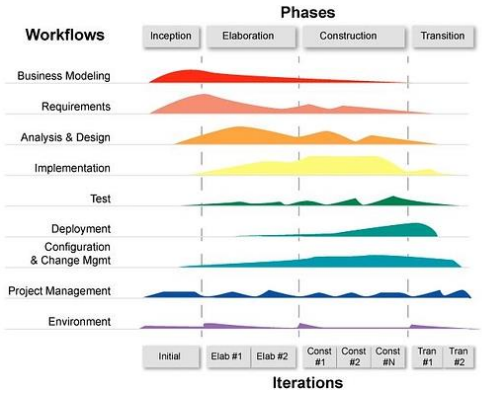
Project Management Institute.

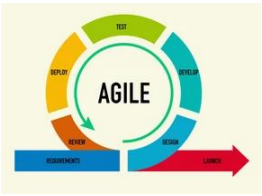
PRINCE2®

AXELOS GLOBAL BEST PRACTICE

IPMA®

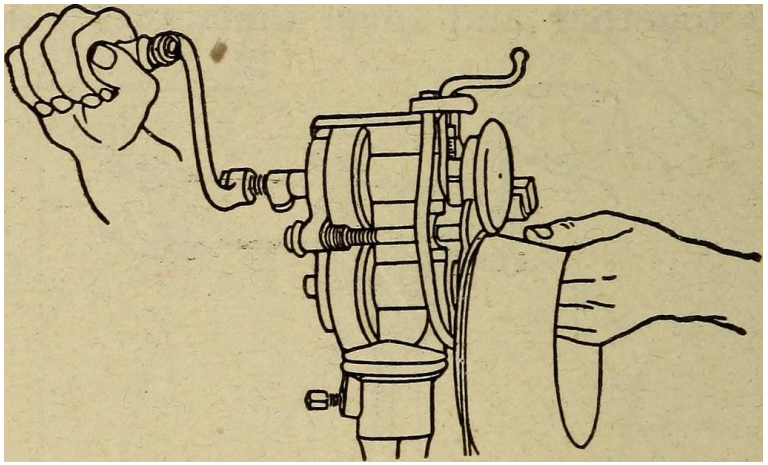
Scrum Alliance CSPO CERTIFIED





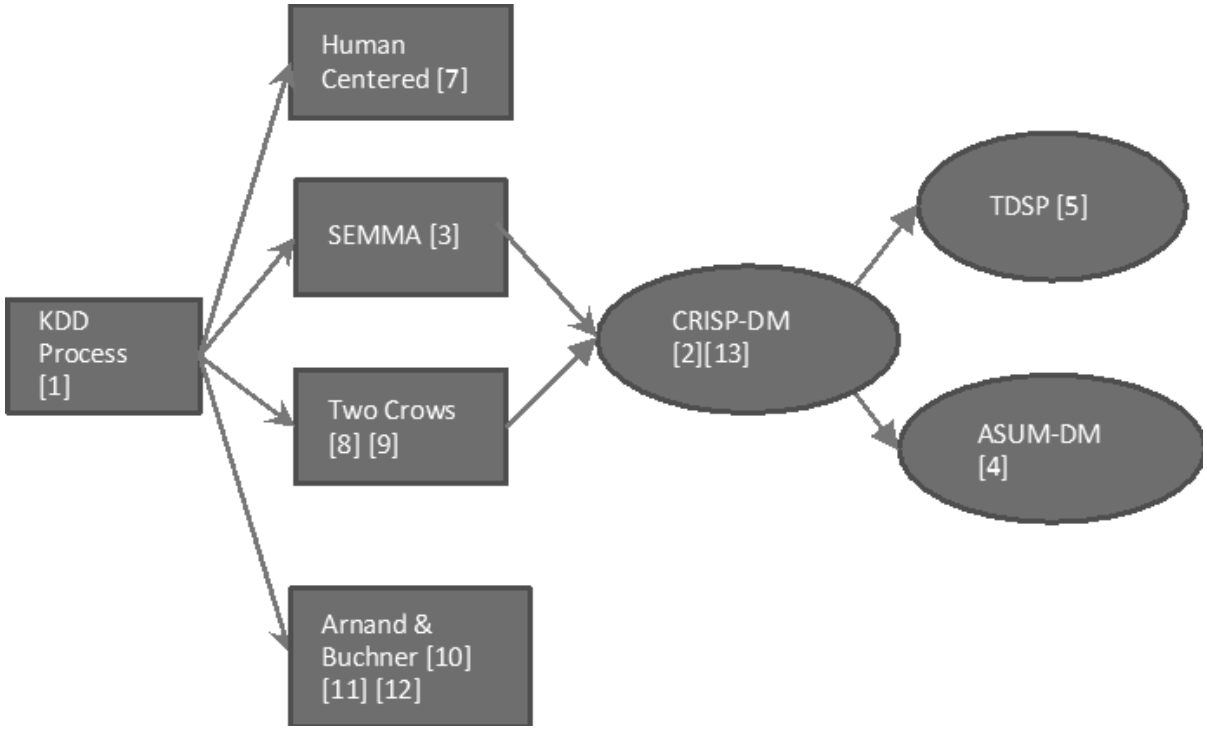
Context

- methodology that may contribute to the improvement of the knowledge creation outputs.



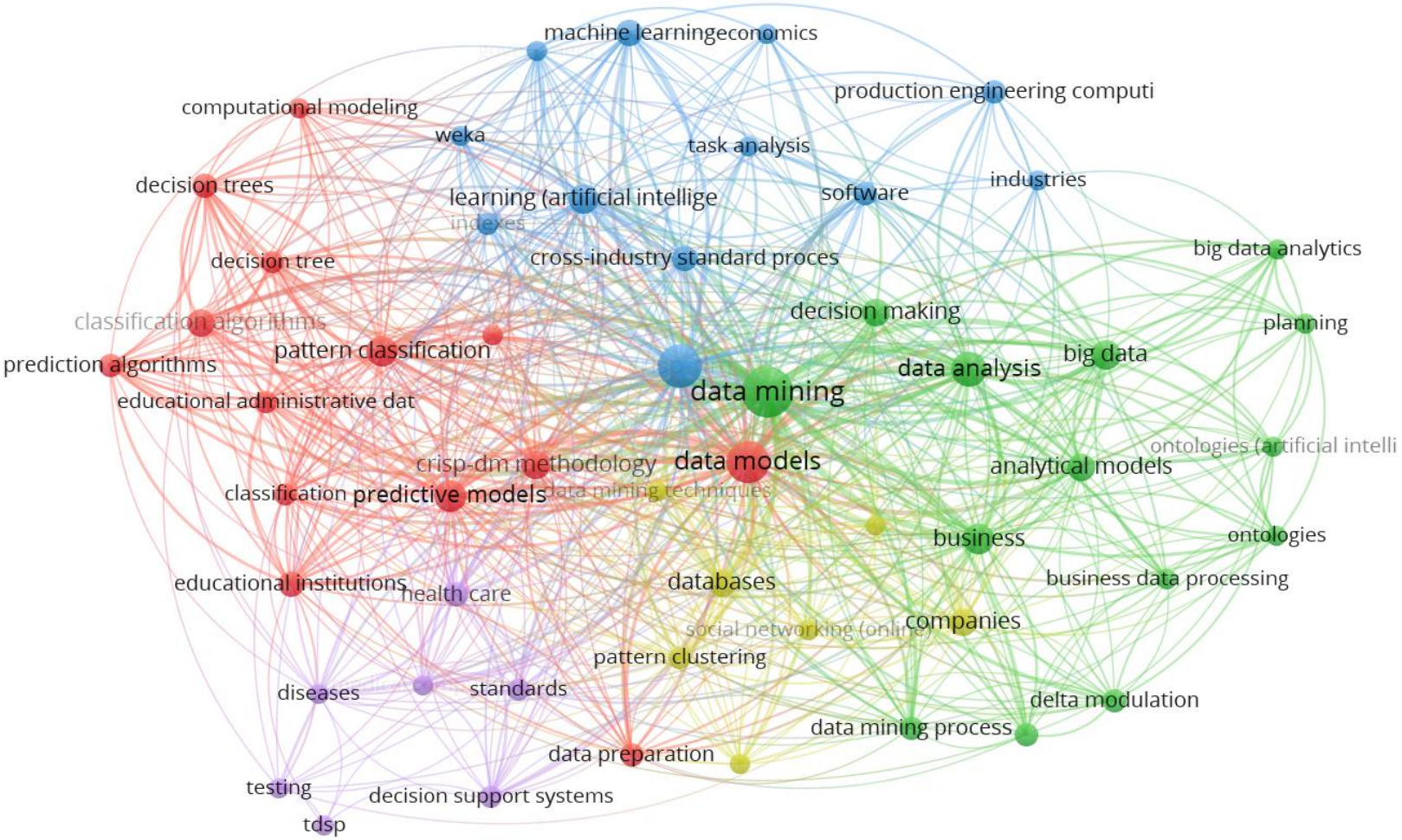
Related Work

- Process



Costa & Aparicio (2020)

Related Work

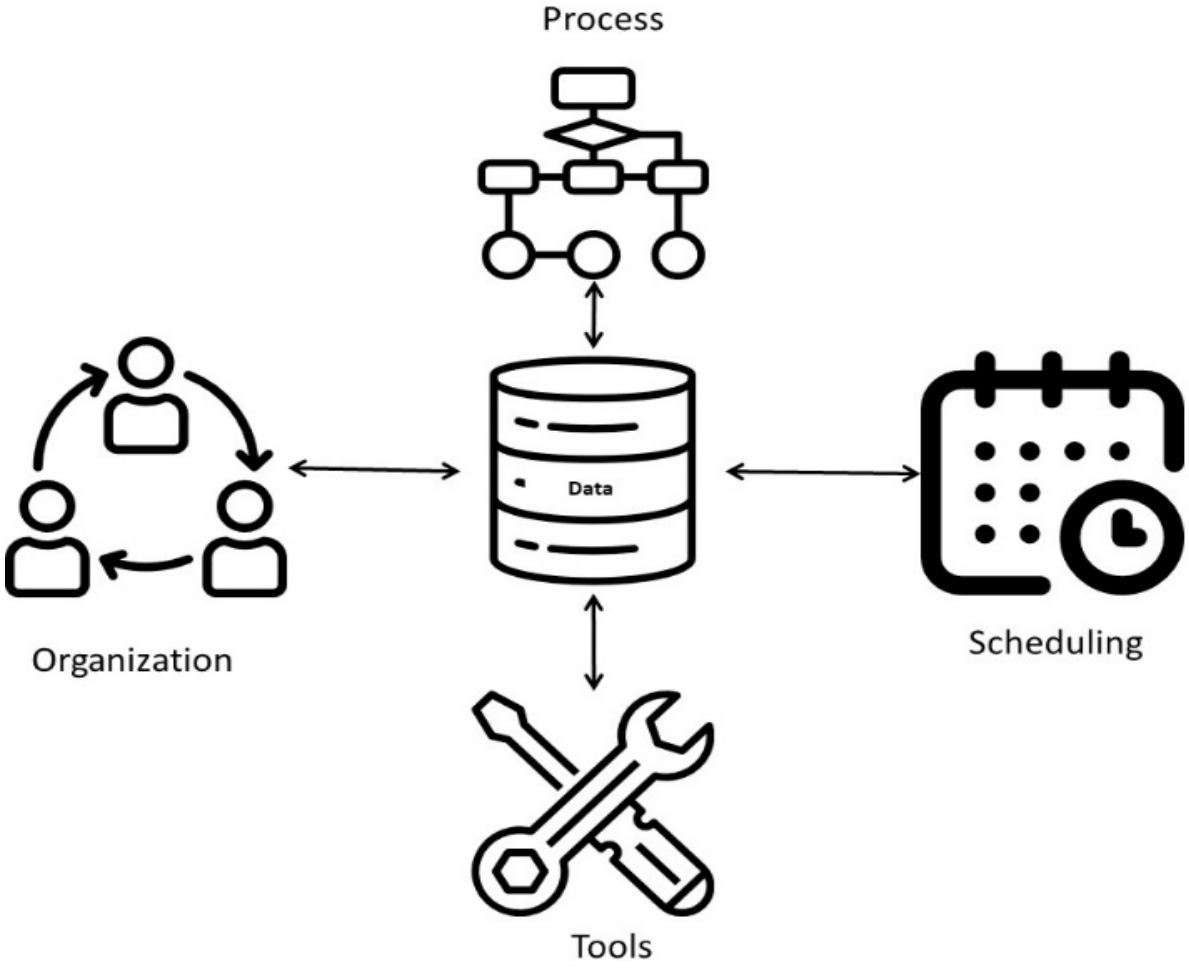


Costa & Aparicio (2021)

Related Work

- Summarizing, the approaches related to data mining, machine learning and data science may be interrelated.
- CRISP-DM is one of the most used and the one that inspired many other approaches.
- Nevertheless, other features may be added to this approach:
  - Organization
  - Scheduling
  - Tools

Proposing a Model



POST-DS

		BA	DE	DS	WD	Risk	w1	w2	w3	w4	w5	w6	w7	w8	w9	w10	w11	w12	w13	w14	Tools and Resource
1	**Business Understanding**																				
1.1.	Define Business Objectives																				
1.2.	Identify ethical values and privacy	A/R				L															meeting
1.3.	Assess Situation	A/R				L															meeting
1.4.	Define Data Science Goals	A/R				L															meeting
1.5.	Produce Project Plan	A/R	R	R		L															WBS, GANTT
2	**Data Understanding**																				
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3	**Data Preparation**			A/R																	
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5.3.	Determine Next Steps	A/R				L															meeting
6	**Deployment**																				
6.1.	Plan Deployment	A		R	R	H															PowerBI or Flash
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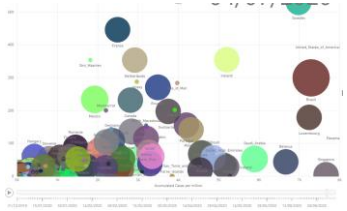
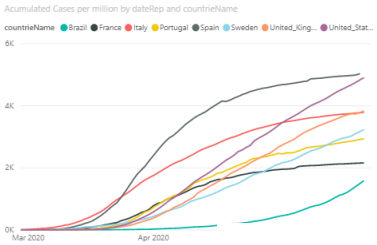
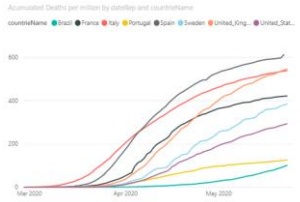
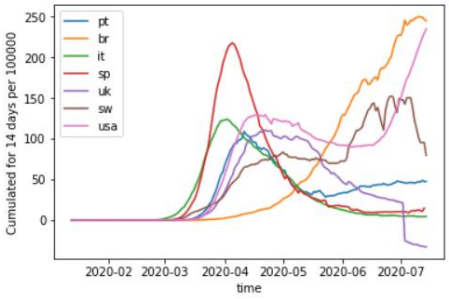
Using the model

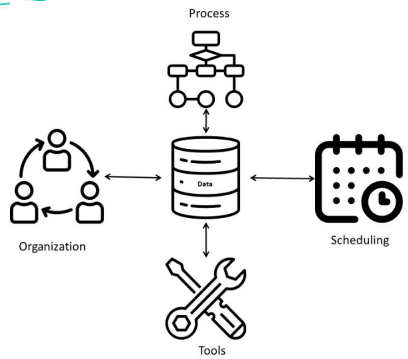
- Covid
- Financial market
- Real estate
- Politics
- Software Development Business
- Academic context
- Professional work

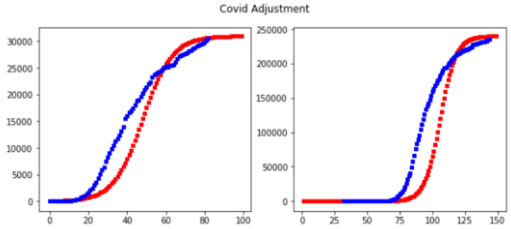


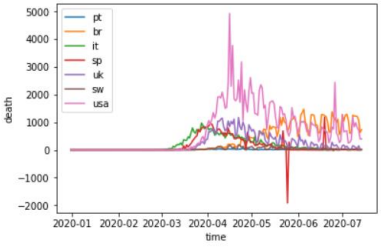












Using the model

Sentiment Analysis of Portuguese Political Parties Communication

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ABSTRACT

Political communication in social media has gained increasing importance in the last years. In this study, we analyze the political parties' communication on Twitter and understand the sentiment of their communication. First by identifying their communication performance regarding the daily number of tweets, favorite tweets, number of retweets per day and per political party. We present a sentiment analysis by the political party using tweets data. In this study, we propose an explanatory model with the main drivers of retweets. To conduct this study, our approach used data analysis and machine learning techniques methods. Results indicate the main determinants that influence future retweets of political posts globally. Here we present a comparison of the communication content between tweets posts and the political parties' programs available on their institutional websites. We identify the similarities between tweets and formal programs per party and among all parties. This study contributes to analyze the coherence and effectiveness of the political parties' communication.

CCS CONCEPTS

• **General and reference;** • **Cross-computing tools and techniques;** • **Empirical studies;;** • **Information systems;** • **Information retrieval;** • **Retrieval tasks and goals;** • **Sentiment analysis;;** • **Computing methodologies;** • **Artificial intelligence;** • **Natural language processing;;** • **Machine learning;**

KEYWORDS

Twitter, political parties, sentiment analysis, document similarity, machine learning

ACM Reference Format:

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SIGDOC '21, October 12–14, 2021, Virtual Event, USA

ACM ISBN 978-1-4503-8628-9/21/10…$15.00
https://doi.org/10.1145/3472714.3473624

1 INTRODUCTION

Political parties are increasingly using social media to communicate their values and ideas. An example of such behavior was when Barack Obama's staff successfully used Twitter in the 2008 presidential elections [13]. This practice persisted in Donald Trump's administration in 2016 [14]. However, using social media is not a panacea *per se*. It is also essential to analyze what is the effectiveness of what is being communicated to the public. The cohesion between parties' political agenda versus their social media communication needs to be addressed [27]. Are parties communicating according to their goals, or is it all part of a hype machine? [16] The usage of social media in a political context has been studied by several authors [6, 7, 13, 14]. In this context, the evolution in natural language processing and sentiment analysis is significant. Nevertheless, there is a research gap in the Portuguese language and its application in a political context as well [15]. The purpose of the work performed in this paper is to analyze political parties' communication, expressed explicitly by the official Twitter accounts of such parties. To reach this main goal, we state four research objectives (RO) as follows: RO1: Identify the performance of each political party on Twitter; RO2: Identify the global sentiment per political party in Twitter communication; RO3: Identify the drivers of retweet behavior in political parties; RO4: Understand the similarities between social media communication and political program communication.

We used data analysis and machine learning techniques described in section 3 of this paper for each of these research objectives. This study contributes to a better understanding of how political parties communication in Twitter can be analyzed in terms of the sentiment of posts, and globally we contribute to analyze the coherence and effectiveness of the political parties communication. We also used also conducted our approach following a data science perspective [22, 23].

2 LITERATURE REVIEW

Social media analysis has been a study in the context of design of communication [22, 24, 25]. In this context, many approaches were used [22, 24]. Social media usage has been studied to identify the performance of each political party in Twitter [17]. Twitter is also a relevant data source to identify the global sentiment per political party in Twitter communication [18]. Sentiment analysis refers to using several approaches, like natural language processing, text analysis, computational linguistics, and biometrics, to systematically identify, extract, quantify, and study affective states and subjective information. Emotions can be reactions to internal stimuli (such as thoughts or memories) or events in our environment.

J. T. Aparicio, J. Salema de Sequeira and C. J. Costa, "Emotion analysis of Portuguese Political Parties Communication over the covid-19 Pandemic," *2021 16th Iberian Conference on Information Systems and Technologies (CISTI)*, 2021, pp. 1-6, doi: 10.23919/CISTI52073.2021.9476557.

Emotion analysis of Portuguese Political Parties Communication over the covid-19 Pandemic

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Abstract — In this paper, we explore the use of emotions in the Portuguese political parties' (with a seat in the Portuguese Parliament) communication as expressed by their official Twitter accounts, as of March 2020. The chosen period of our investigation is particularly interesting because political parties had a chance to communicate their views during a pandemic situation and over a period of one year. These views include possible solutions to face the crisis and their comments on the development of the whole situation. Using a standard lexicon we classified the amount of particular emotions in different tweets. Using this method we plotted the average positivity and negativity along time per party. We also analyzed the impact of each emotion to classify positivity using the present corpus. Finally, we considered some important words regarding the pandemic and their average positivity score. The analysis allows us to identify different approaches to participation in social media according to different strategies, more than political ideology.

Keywords - political communication; Portuguese political parties; Portuguese parliament; Portuguese; lexicon; sentiment analysis; emotions; visualization; social media; twitter; covid-19.

I. INTRODUCTION

Now-a-days, different political actors are increasingly using social media platforms to communicate their worldviews. American Presidents have used Twitter heavily to communicate their position in relation to specific ideas and to specific policies [5]. Hence it is essential to analyse what is being communicated and even more important how this communication is being done in order to best assess their impact. Political communication can help us explain the ups and downs of the electoral polls and the electoral success of a certain political party or individual in the following election.

The publication of *The Gutenberg Galaxy: The Making of Typographic Man* [8] considers the effects of social media in different human dimensions. However, a new empirical approach is needed, one that considers the effects of social networks or to put it simply a Zuckerberg Galaxy approach which demonstrates how Facebook, Twitter, and other social media are used and to what extent they have a more decisive influence on some of the voters, in comparison to the traditional media. In this context, the evolution in Natural Language Processing (NLP) and sentiment analysis is significant, however the political communication in Portugal has not yet been a subject of this kind of study, since the available models and lexicons are not yet adapted to European Portuguese. In this sense, we aim to answer the following question: What are the prevalent emotions in the Portuguese political parties' tweets during over the first year of the covid-19 pandemic?

The purpose of the work performed in this paper is to analyse the communication of the official Twitter accounts of the Portuguese political parties. The time frame ranges through 3200 last tweets, going as back as March 2020, when the first case of covid-19 was registered in the country. This period is specially interesting because political parties had a chance to communicate to the electorate their ideas in face of a social and economic crisis. It is important to take into consideration that the different parties tweeted with a different frequency, however the reality they were facing was one and the same.

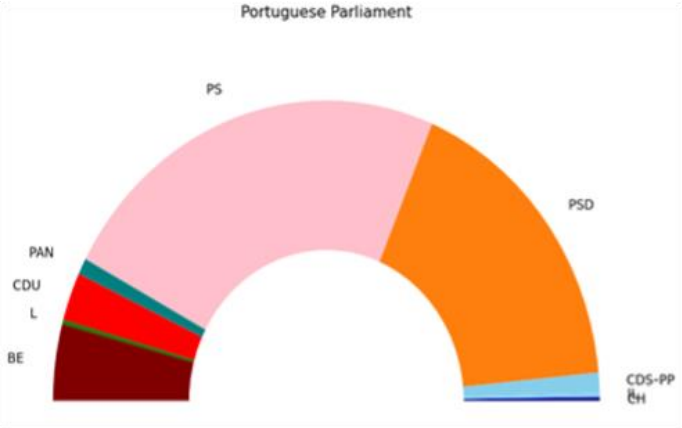
II. LITERATURE REVIEW

Sentiment analysis refers to using several approaches, such as: natural language processing, text analysis, computational linguistics, and biometrics, to systematically identify, extract, quantify, and study affective states and subjective information.

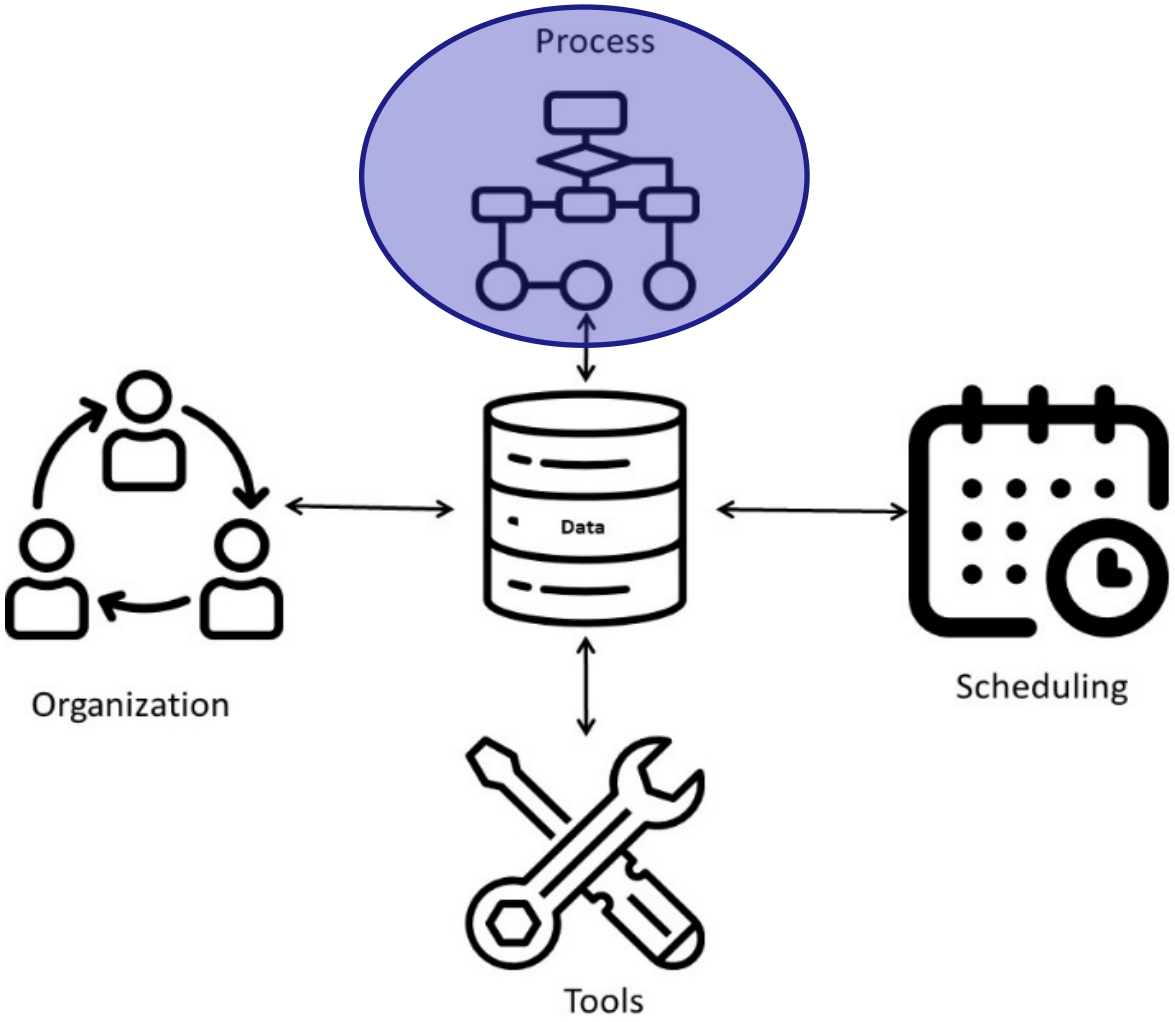
Emotions can be reactions to internal stimuli (such as thoughts or memories) or events in our environment. To analyze emotions, Mohammad and Turney [1] proposed a lexicon. This lexicon uses six emotions [2], [3]: joy, sadness, anger, fear, disgust, and surprise, along with how positive and negative the words are. These are a subset of the eight emotions proposed in Plutchik [4] which are still relevant today [10]. Recently the study of the impact of texts on such emotions has been done, namely in the USA political context [5]. This was done with a focus on awareness and topical emergence. However, there was no analysis over the emotion on the content of the message shared by the political parties, instead it was

Using the model

- Emotion analysis of Portuguese Political Parties Communication

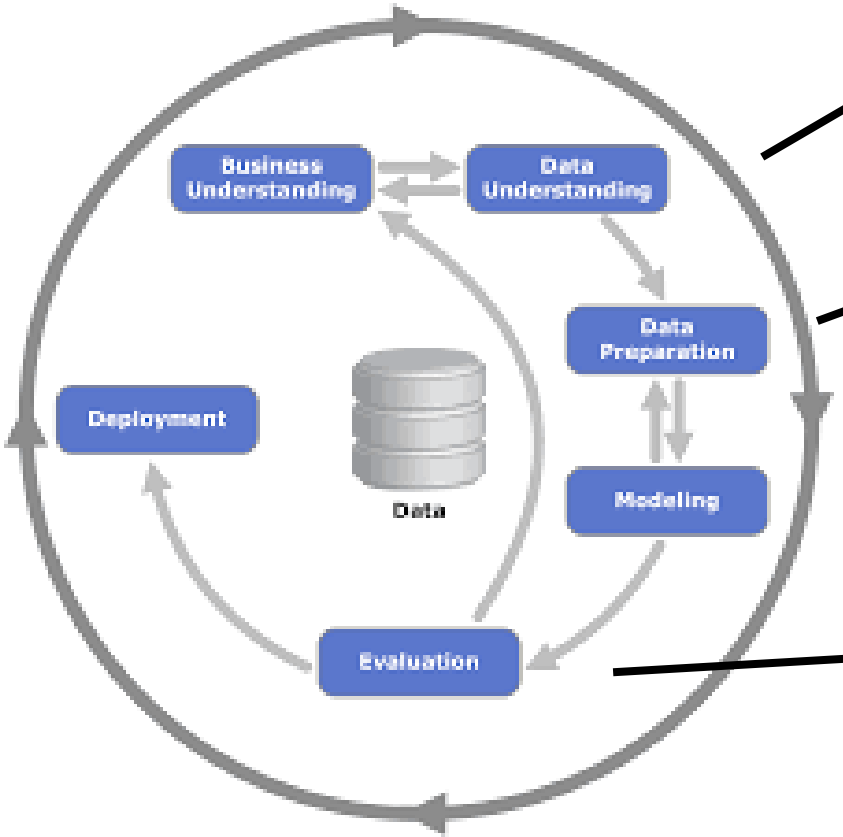


Process



Process

- Process



Collect Tweets

Collect Programs

Clean, translate

Regression

Similarity analysis

Political science analysis

Process

		BA	DE	DS	WD	Risk	w1	w2	w3	w4	w5	w6	w7	w8	w9	w10	w11	w12	w13	w14	Tools and Resource
	Business Understanding																				
.1.	Define Business Objectives																				
.2.	Identify ethical values and privacy	A/R				L															meeting
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	Data Preparation			A/R																	
.1.	Select Data			A/R		M															Meeting
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.1.	Select Modeling Techniques			A/R		H															MIT flowchart
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.2.	Plan Monitoring and Maintenance	A				M															meeting
.3.	Produce Final Report	A/R	R	R	R	M															PowerBI or Flash
.4.	Review Project	A/R		R		M															meeting

Process

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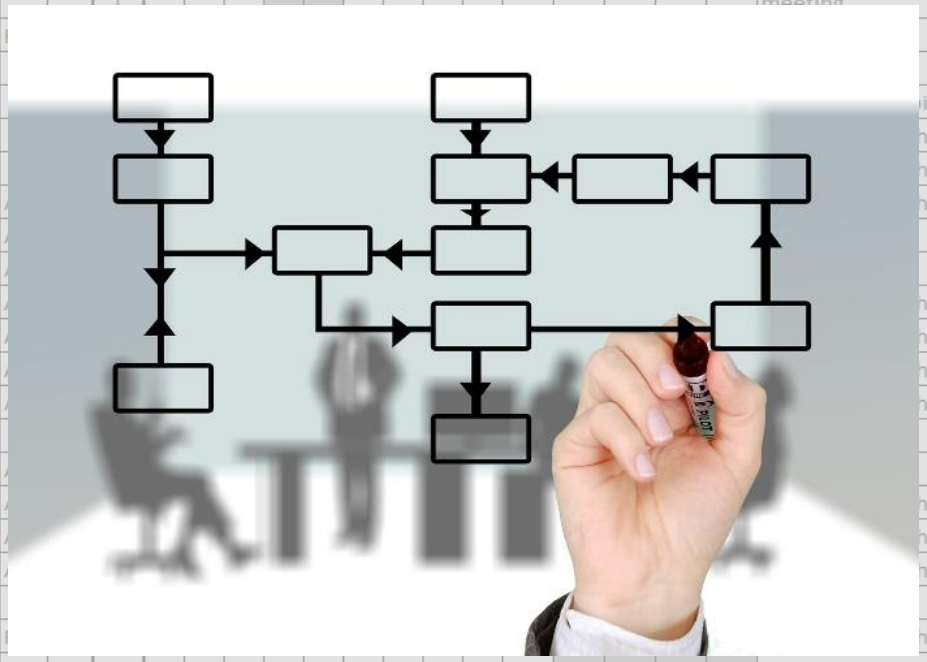
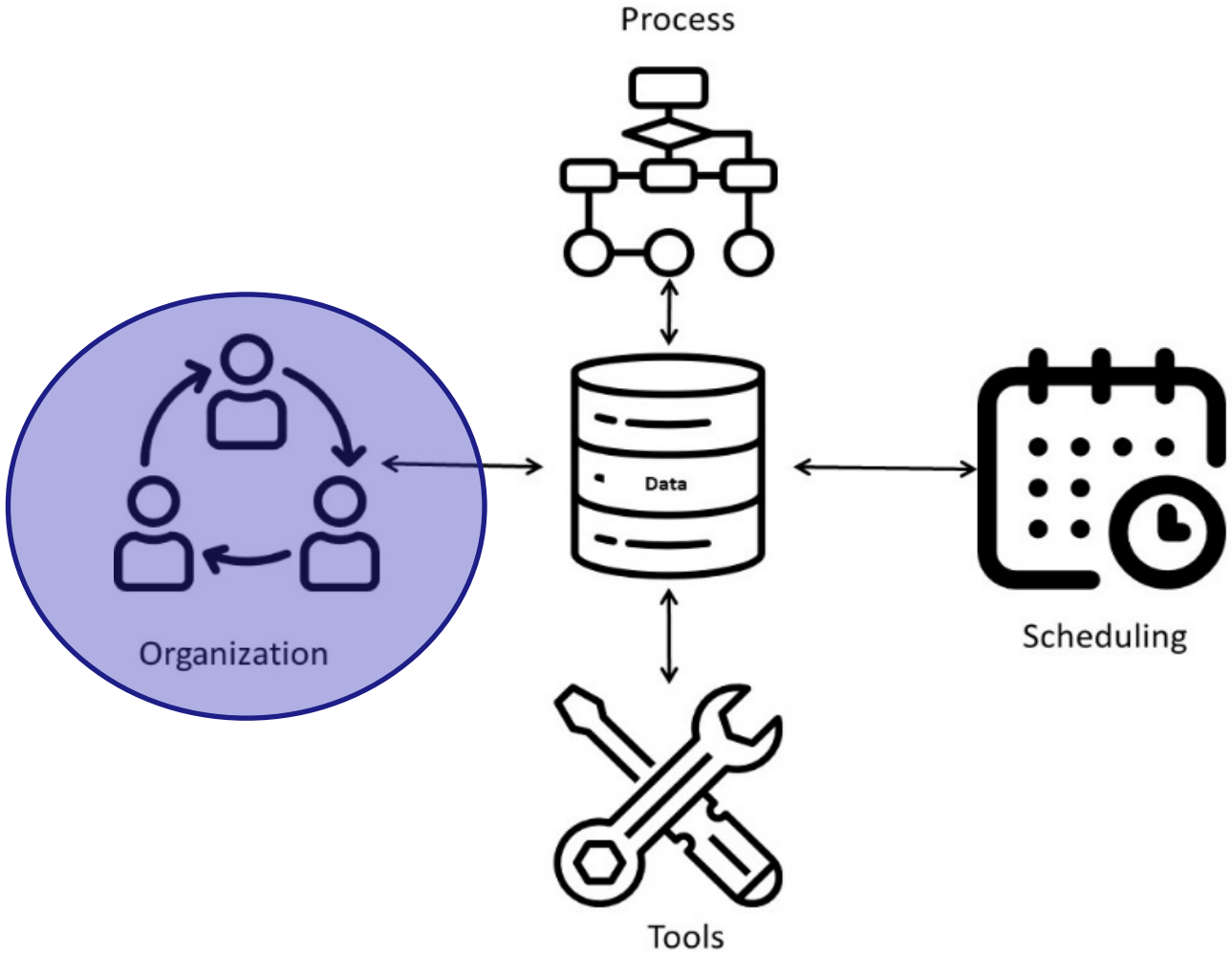


Organization



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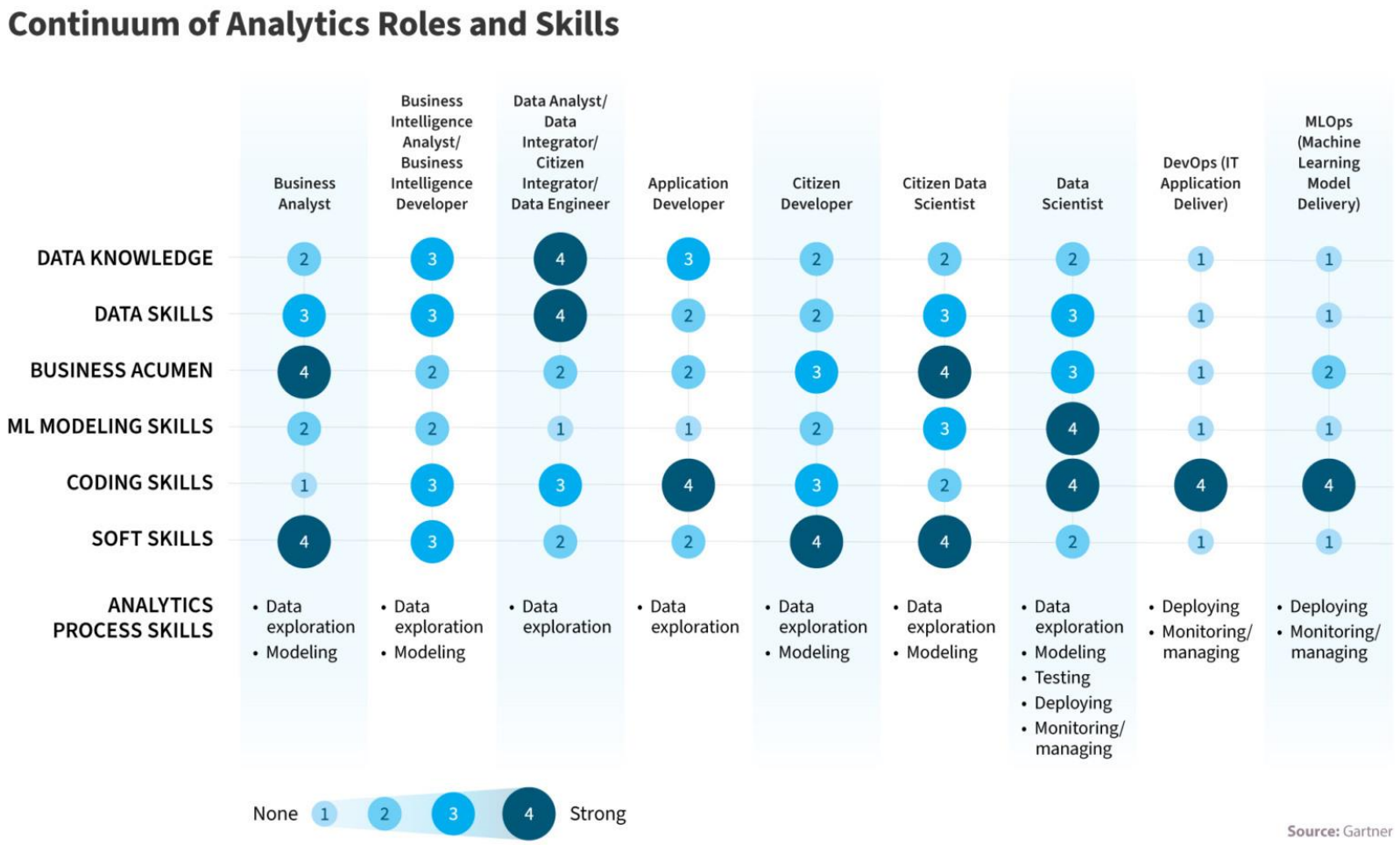

Organization

- Process
- Organization
- Scheduling
- Tools

Organization

		A	DE	DS	WL	Risk	w1	w2	w3	w4	w5	w6	w7	w8	w9	w10	w11	w12	w13	w14	Tools and Resource
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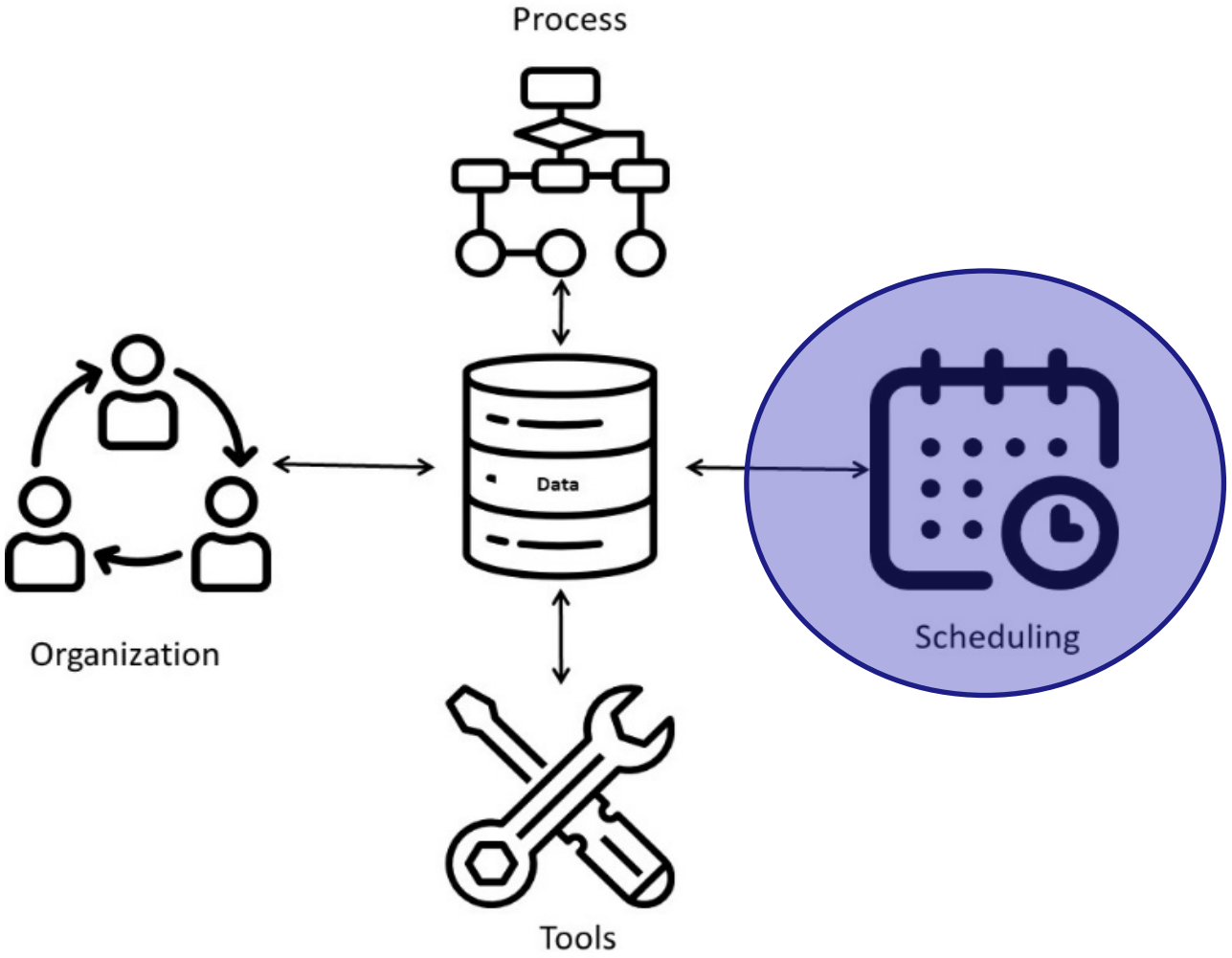
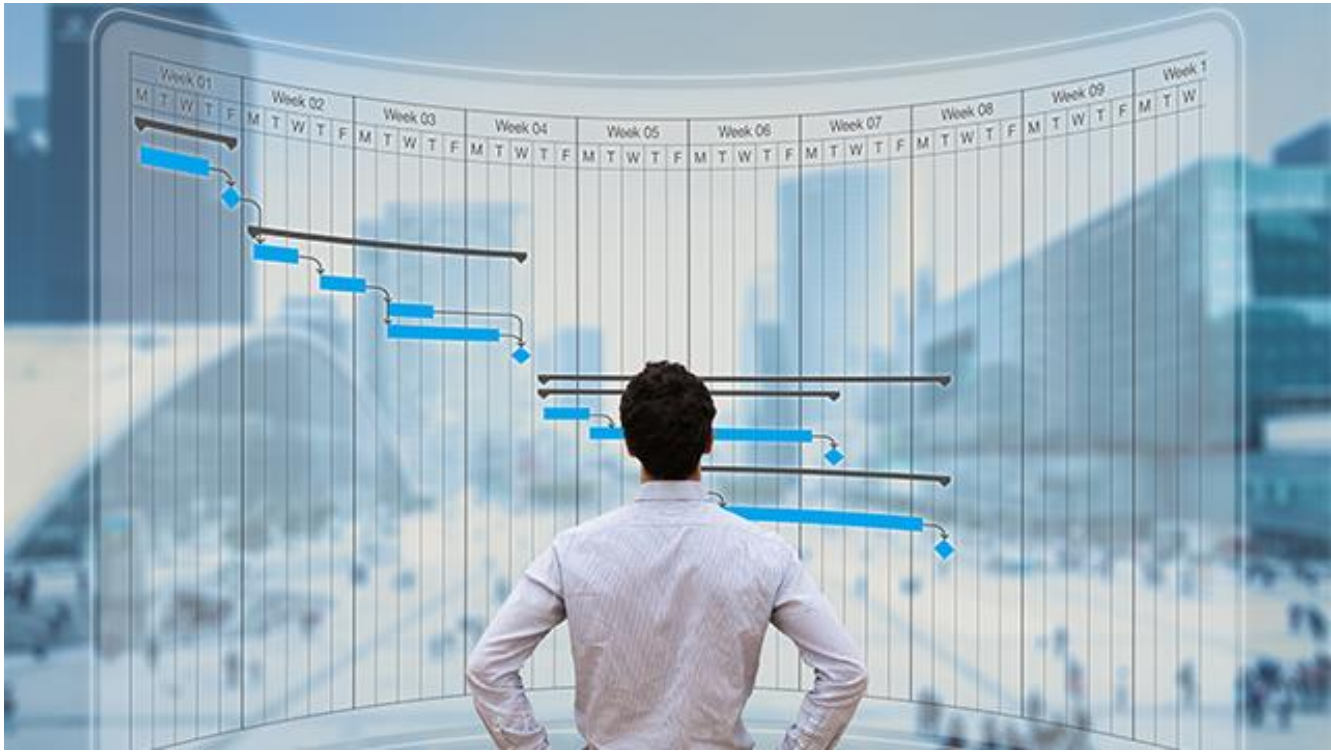
6.1.	Plan Deployment			R	R	H															PowerBI or Flash
6.2.	Plan Monitoring and Maintenance					M															meeting
6.3.	Produce Final Report	/R	R	R	R	M															PowerBI or Flash
6.4.	Review Project	/R		R		M															meeting

Scheduling



Scheduling

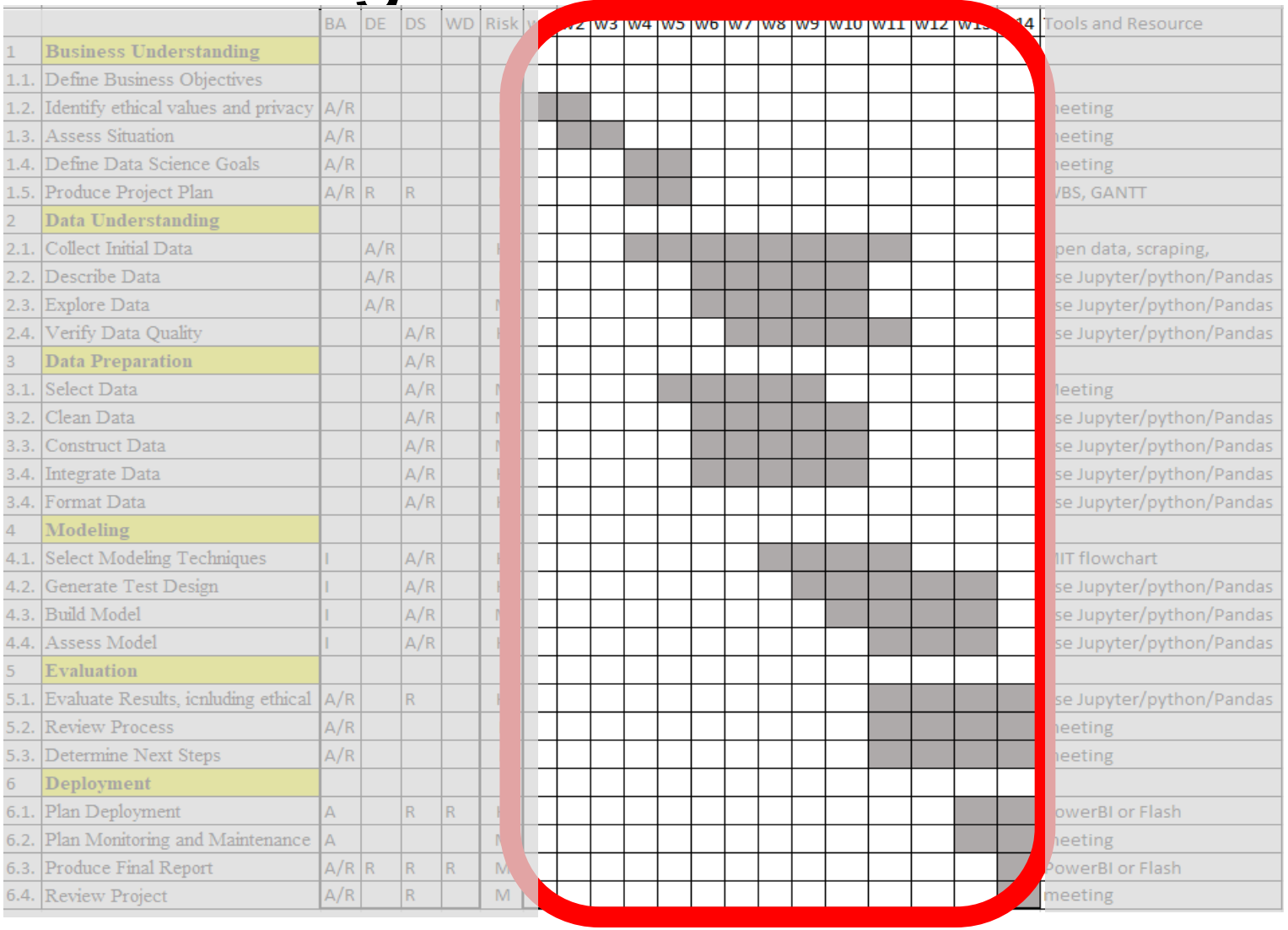
- Process
- Organization
- Scheduling
- Tools



Scheduling

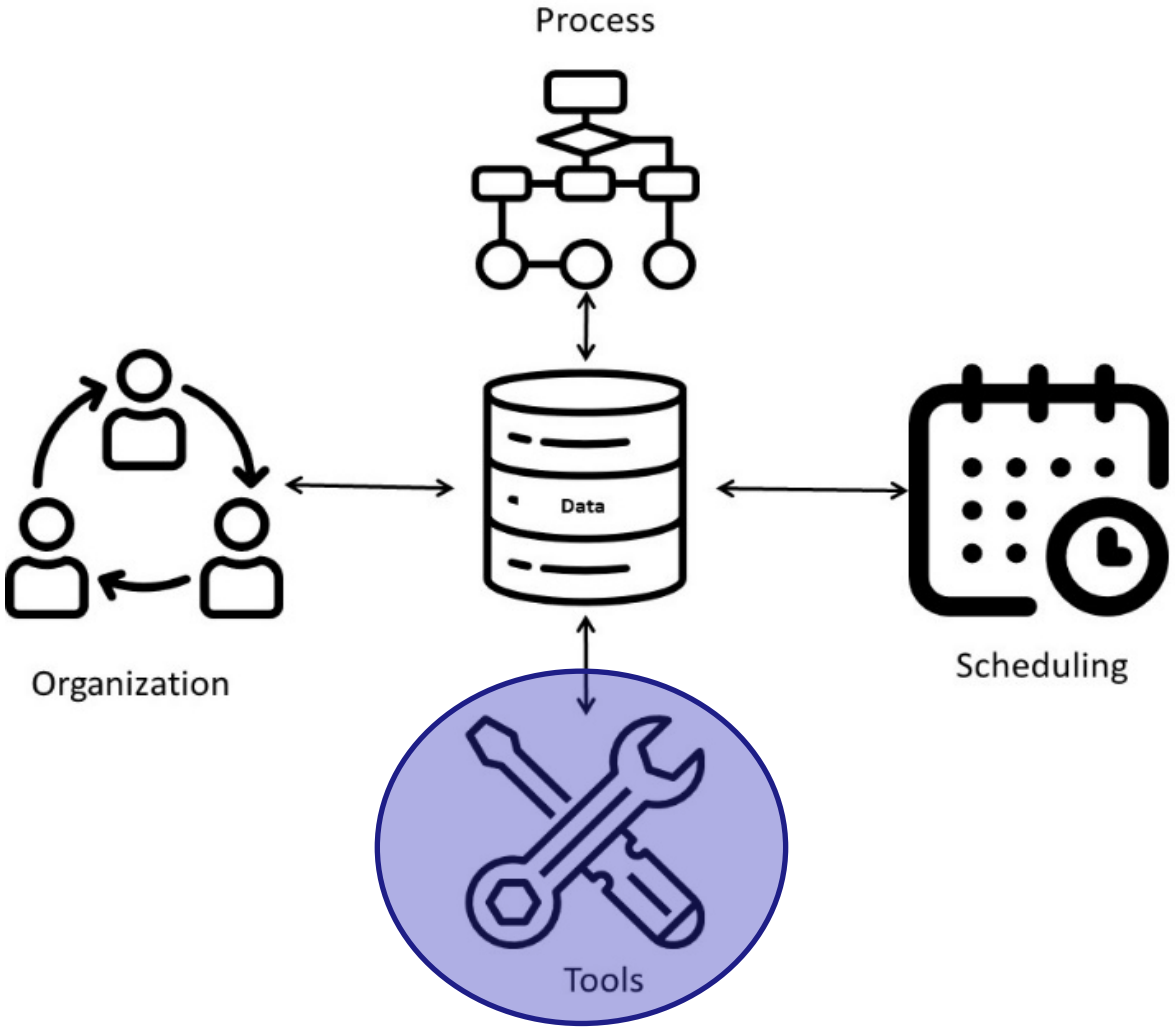
- Process
- Organization
- Scheduling
- Tools

Scheduling



		BA	DE	DS	WD	Risk	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	Tools and Resource
1	**Business Understanding**																			
1.1.	Define Business Objectives																			
1.2.	Identify ethical values and privacy	A/R																		eeting
1.3.	Assess Situation	A/R																		eeting
1.4.	Define Data Science Goals	A/R																		eeting
1.5.	Produce Project Plan	A/R	R	R																VBS, GANTT
2	**Data Understanding**																			
2.1.	Collect Initial Data		A/R																	pen data, scraping,
2.2.	Describe Data		A/R																	se Jupyter/python/Pandas
2.3.	Explore Data		A/R																	se Jupyter/python/Pandas
2.4.	Verify Data Quality			A/R																se Jupyter/python/Pandas
3	**Data Preparation**			A/R																
3.1.	Select Data			A/R																leeting
3.2.	Clean Data			A/R																se Jupyter/python/Pandas
3.3.	Construct Data			A/R																se Jupyter/python/Pandas
3.4.	Integrate Data			A/R																se Jupyter/python/Pandas
3.4.	Format Data			A/R																se Jupyter/python/Pandas
4	**Modeling**																			
4.1.	Select Modeling Techniques	I		A/R																MIT flowchart
4.2.	Generate Test Design	I		A/R																se Jupyter/python/Pandas
4.3.	Build Model	I		A/R																se Jupyter/python/Pandas
4.4.	Assess Model	I		A/R																se Jupyter/python/Pandas
5	**Evaluation**																			
5.1.	Evaluate Results, icnluding ethical	A/R		R																se Jupyter/python/Pandas
5.2.	Review Process	A/R																		eeting
5.3.	Determine Next Steps	A/R																		eeting
6	**Deployment**																			
6.1.	Plan Deployment	A		R	R															owerBI or Flash
6.2.	Plan Monitoring and Maintenance	A																		eeting
6.3.	Produce Final Report	A/R	R	R	R	M														PowerBI or Flash
6.4.	Review Project	A/R		R		M														meeting

Tools



Tools

		BA	DE	DS	WD	Risk	w1	w2	w3	w4	w5	w6	w7	w8	w9	w10	w11	w12	w13	w14	ools and Resource
1	**Business Understanding**																				
1.1.	Define Business Objectives																				
1.2.	Identify ethical values and privacy	A/R				L															meeting
1.3.	Assess Situation	A/R				L															meeting
1.4.	Define Data Science Goals	A/R				L															meeting
1.5.	Produce Project Plan	A/R	R	R		L															WBS, GANTT
2	**Data Understanding**																				
2.1.	Collect Initial Data		A/R			H															open data, scraping,
2.2.	Describe Data		A/R			L															use Jupyter/python/Pandas
2.3.	Explore Data		A/R			M															use Jupyter/python/Pandas
2.4.	Verify Data Quality			A/R		H															use Jupyter/python/Pandas
3	**Data Preparation**			A/R																	
3.1.	Select Data			A/R		M															Meeting
3.2.	Clean Data			A/R		M															use Jupyter/python/Pandas
3.3.	Construct Data			A/R		M															use Jupyter/python/Pandas
3.4.	Integrate Data			A/R		H															use Jupyter/python/Pandas
3.4.	Format Data			A/R		H															use Jupyter/python/Pandas
4	**Modeling**																				
4.1.	Select Modeling Techniques	I		A/R		H															MIT flowchart
4.2.	Generate Test Design	I		A/R		H															use Jupyter/python/Pandas
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5.1.	Evaluate Results, icnluding ethical	A/R		R		H															use Jupyter/python/Pandas
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6	**Deployment**																				
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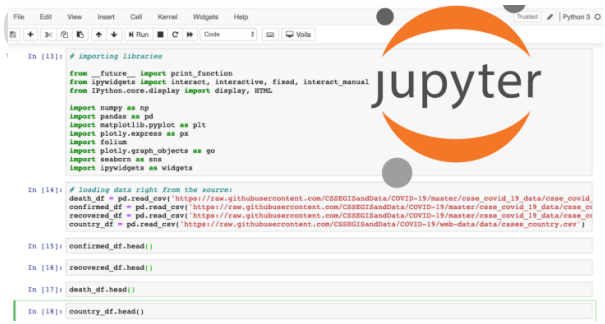
6.4.	Review Project	A/R		R		M															eeting

Tools

- Process
- Organization
- Scheduling
- Tools

	coef	std err	t	P>|t|	[0.025	0.975]
const	-1.4423	0.415	-3.473	0.001	-2.256	-0.628
Favorites	0.2296	0.001	349.796	0.000	0.228	0.231
neg	2.0056	0.685	2.930	0.003	0.664	3.347
neu	0.3320	0.435	0.762	0.446	-0.522	1.186
pos	-0.4631	0.594	-0.780	0.436	-1.627	0.701
lenTex	-0.0038	0.001	-4.718	0.000	-0.005	-0.002
Hashtags	0.2503	0.049	5.119	0.000	0.154	0.346
Mentions	0.3500	0.086	4.069	0.000	0.181	0.519

Omnibus:	47844.549	Durbin-Watson:	1.638
Prob(Omnibus):	0.000	Jarque-Bera (JB):	738581430.277
Skew:	15.841	Prob(JB):	0.00
Kurtosis:	865.992	Cond. No.	2.59e+03



Test Data

	R2	MAE	MSE
OLS	0.764957	3.444953	104.684972
Ridge	0.764956	3.444938	104.685139
Lasso	0.765343	3.421643	104.512759
BayesianRidge	0.764878	3.438733	104.720064
Polynomial Regression	0.717263	2.814491	125.927009
Neural Network (MLP)	0.746654	2.942042	112.836870

Conclusions

- Adequate Approach
- Many roles and people with different backgrounds
- Improve organization contribution
- Improve scheduling
- Allows results vs. expectations adjustment
- Main limitation: Bureaucracy

References

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Thank
you