CASE STUDY

Knowledge Graph using Social Media Posts

Problem Statement: Understanding customer sentiments about products is of utmost priority for any product company including HP. Consumers are more vocal on social media platforms and expressing their feedback and experience about any product. HP too need to know consumer sentiments first-hand so that it can make better products with great user experience and resolve customer issue faster. We need a one stop knowledge store, which can store reviews, suggestions, complaint and sentiments for all HP consumer printers/PC/laptop. This will help HP understand the consumers better and improve brand value and NPS score.

Outcome: The solution should be able to crawl social media platforms such as (facebook, twitter, LinkedIn etc.)for posts talking about HP PC and Printers.

It should be able to classify/tag posts with a HP PC/printer brand or model, detect feature or problem the post is talking about and identify sentiments(complaint, suggestion or appreciation).

The output should be in the form of a **knowledge graph** which can be queried by stakeholders for better customer service, product improvement and faster resolution. The query can be like «List all posts talking about wifi issue in printer model X or brand Y».

Skills required : Web Data Mining, NLP, ML/DL, Web API

SOLUTION:

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Jalandhar ,Btech CSE 6th Sem.

These are some idea solution:

1. **Use Machine Learning algorithms :** to classify and tag posts: You can use natural language processing techniques to classify and tag posts based on the brand or model of HP PC or printer being talked about, the feature or problem mentioned in the post, and the sentiment expressed by the author.

To classify and tag posts related to HP PCs and printers, we can use various machine learning algorithms that leverage natural language processing (NLP) techniques. Here are the steps we can follow:

1.1 Data collection: We need to gather a significant amount of data related to HP PCs and printers. This data can include product descriptions, customer reviews, social media posts, forum discussions, and more.

1.2 Data preprocessing: Once we have collected the data, we need to preprocess it by cleaning and formatting it. This can involve tasks such as removing stop words, stemming, lemmatization, and tokenization.

1.2 Feature extraction: The next step is to extract relevant features from the preprocessed data. For example, we can extract the brand and model of HP PCs and printers being talked about, the feature or problem mentioned in the post, and the sentiment expressed by the author.

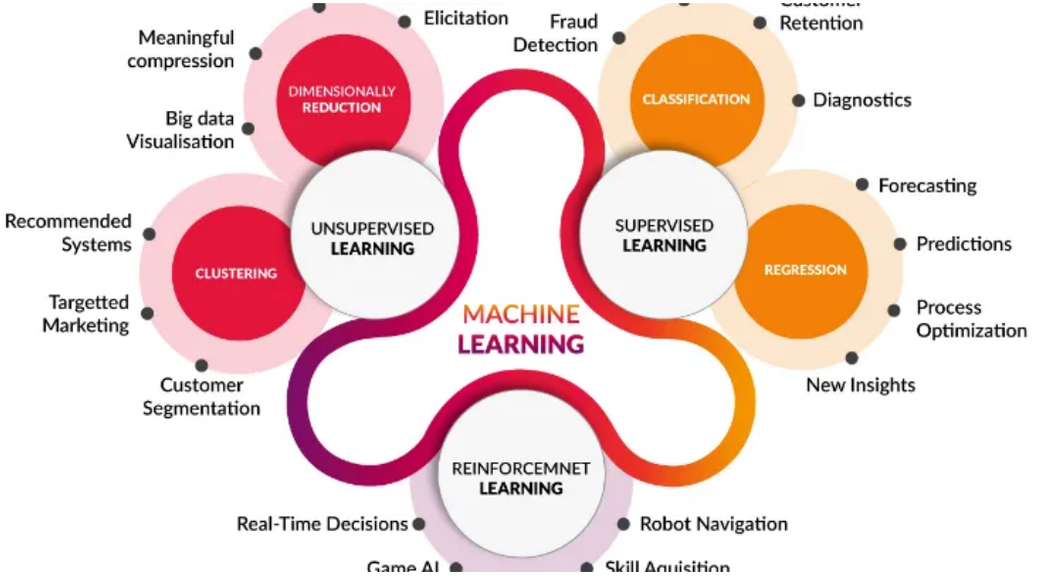
1.4 Model selection: There are several machine learning algorithms that can be used for classification tasks, such as Naive Bayes, Support Vector Machines (SVM), and Random Forests. We can select a suitable algorithm based on the nature of our data and the accuracy and efficiency of the algorithm.

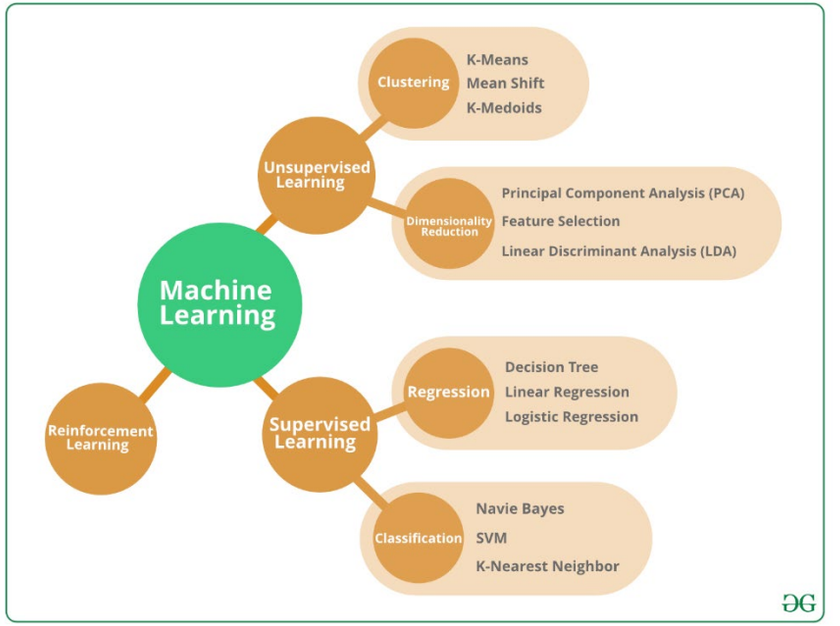
1.5 Model training: We can train our selected machine learning algorithm on a subset of the preprocessed data. The training data should be labeled with the appropriate class or tag.

1.6 Model testing and evaluation: We can test the trained model on a separate subset of the preprocessed data to evaluate its accuracy and performance. We can use metrics such as precision, recall, and F1 score to measure the model's effectiveness.

1.7 Deployment: Once we have a well-trained model, we can deploy it to classify and tag new posts related to HP PCs and printers.

For example, if a customer writes a post on social media about a problem they're having with an HP printer, our machine learning model can automatically tag the post with the appropriate category, such as "printer problem" and "negative sentiment." This can help HP customer service teams quickly identify and address customer issues. Similarly, we can use the same approach to classify and tag posts related to different HP PC models, their features, and customer sentiments expressed about them.





2. **Implement sentiment analysis**: We can use sentiment analysis to identify the overall sentiment of the posts, whether it's positive, negative or neutral. This will help HP identify the most pressing issues that need to be addressed, and also identify what customers like and appreciate about their products.

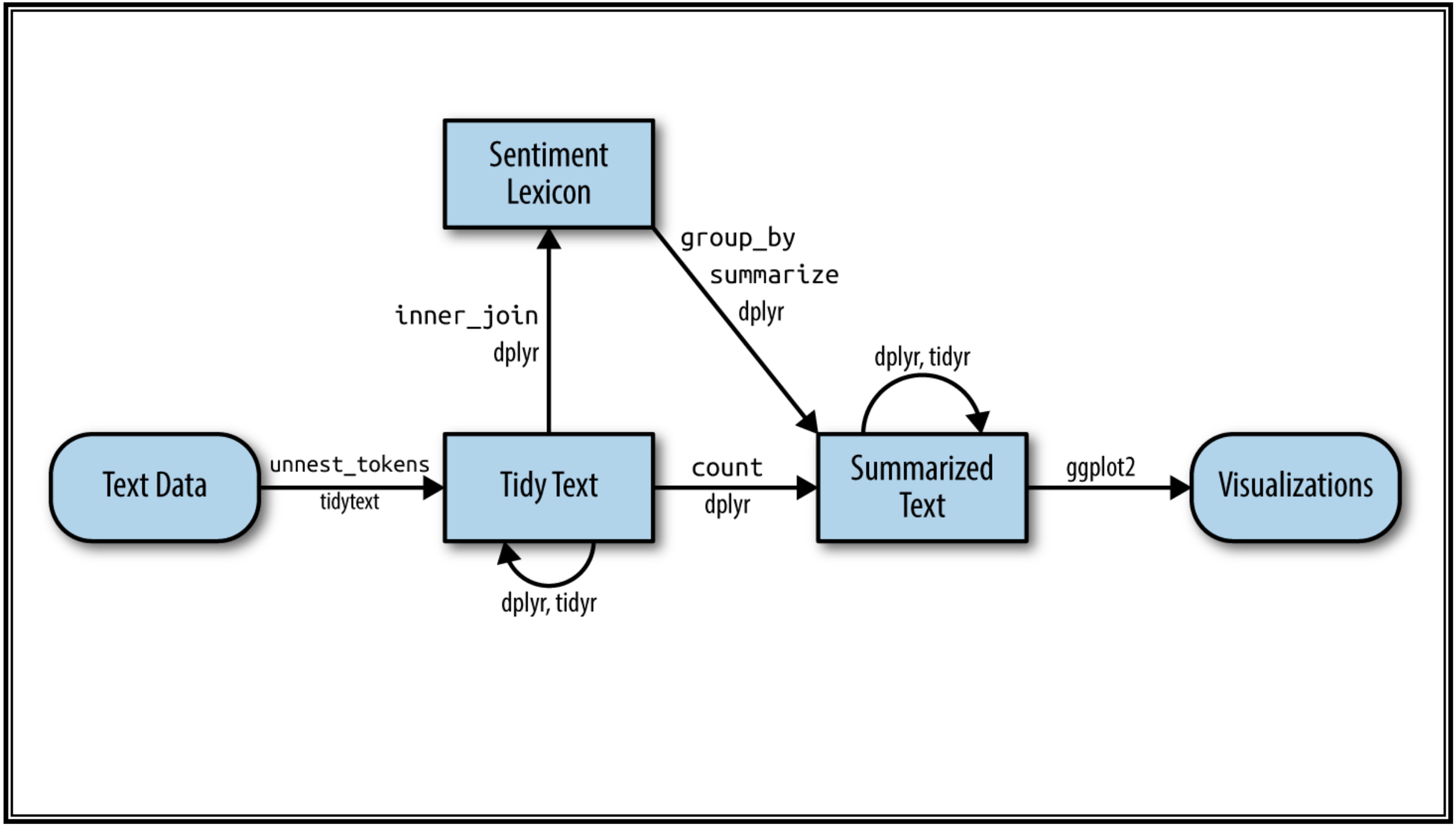
Sentiment analysis is a technique that uses natural language processing (NLP) and machine learning algorithms to identify the sentiment or emotion behind a piece of text, such as social media posts, customer reviews, or feedback surveys. In the case of HP, sentiment analysis can help identify the overall sentiment of customer feedback related to their products and services.

By analyzing customer feedback, sentiment analysis can help HP identify the most pressing issues that need to be addressed, as well as what customers like and appreciate about their products.

For example, if there is a high volume of negative feedback related to a particular product feature, HP can use sentiment analysis to identify the sentiment behind those comments and take action to address the issue. Alternatively, if there is a high volume of positive feedback related to a particular product feature, HP can use sentiment analysis to identify what customers like about that feature and use that information to inform future product development.

Sentiment analysis can also be used to identify patterns and trends in customer feedback over time. By analyzing customer feedback over a period of weeks or months, HP can identify changes in sentiment and adjust their products and services accordingly.

Overall, sentiment analysis is a powerful tool that can help HP stay on top of customer feedback, identify areas for improvement, and make data-driven decisions to improve their products and services.


Sentiment Lexicon
group_by
summarize
dplyr
inner_join
dplyr
dplyr, tidyr
Text Data
unnest_tokens
tidytext
Tidy Text
count
dplyr
Summarized Text
ggplot2
Visualizations
dplyr, tidyr

Fragrance-1
(Lavender)

REVIEWS

1. Smells amazing! A perfect purchase :)
2. Must buy! Super amazing.
3. Quite satisfactory

Fragrance-1
(Rose)

REVIEWS

1. A decent purchase
2. Quite okayish! Smells average
3. Could have been better in lot terms

Fragrance-1
(Lemon)

REVIEWS

1. An absolute waste of money.
2. Total waste of money
3. Terrible smell, not worth buytng

SENTIMENT ANALYZER

POSITIVE (81%)

NEUTRAL (88%)

negative (91%))

3. **Use a knowledge graph to store the data**: A knowledge graph is a powerful tool that can be used to store and organize data in a way that makes it easy to query and analyze. You can use a knowledge graph to store the data collected from social media platforms, and use it to create a visual representation of the relationships between the different data points.

HP is a multinational technology company that produces hardware, software, and other related services. Let's consider the example of creating a knowledge graph to store and analyze data related to HP's social media platforms, including Twitter, Facebook, and LinkedIn.

To create a knowledge graph for this purpose, we would start by identifying the entities and their relationships. Entities could include HP as a company, its products, social media platforms, users, and their interactions. Relationships could include mentions, likes, comments, shares, and followers.

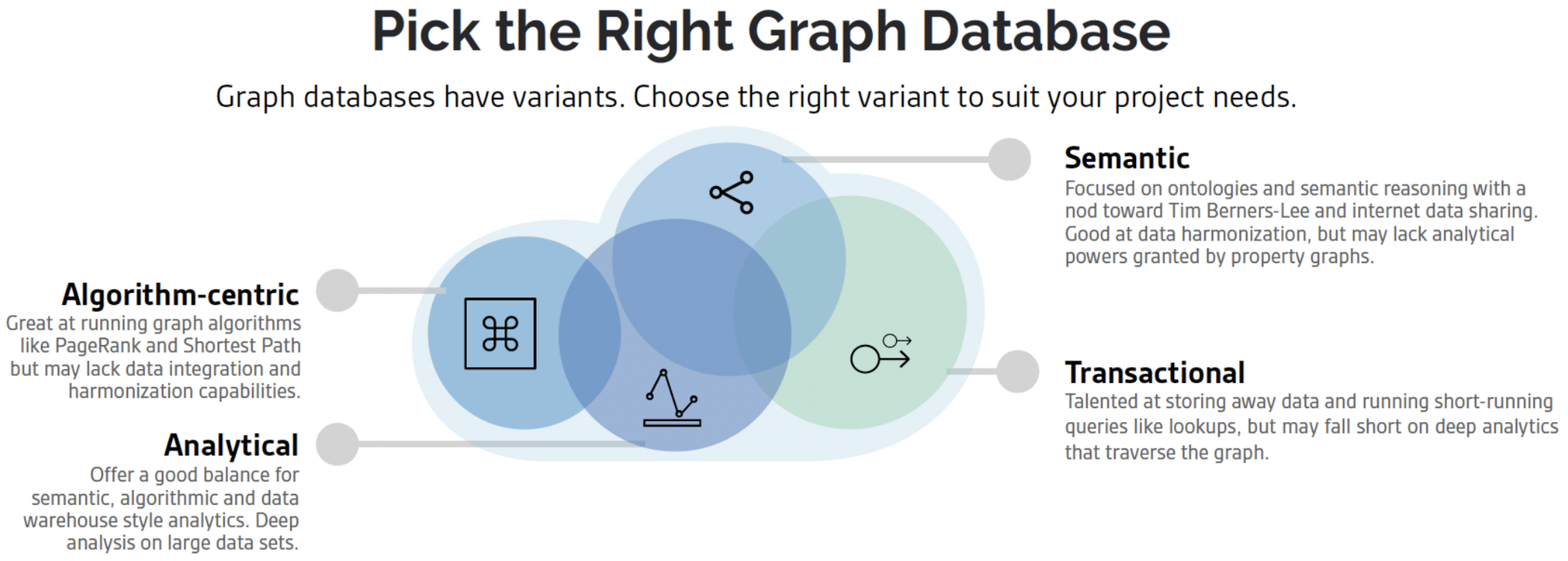
We could then use a graph database, **such as Neo4j,** to store and manage this data. In this graph database, we would create nodes to represent the entities and edges to represent the relationships between them.

For example, we could create a node for HP as a company, with properties such as name, location, and industry. We could then create nodes for its products, with properties such as name, description, and price. We would create edges to represent the relationship between HP and its products, **such as "produces" or "sells."**

Next, we would create nodes for social media platforms, such as Twitter, Facebook, and LinkedIn, with properties such as name and URL. We would then create edges to represent the relationship between HP and its social media platforms, such as "has account on" or "posts to."

Finally, we would create nodes for users, with properties such as name, location, and interests. We would create edges to represent the relationships between users and HP, such **as "follows" or "mentions."**

By storing this data in a knowledge graph, we could then use it to create visual representations of the relationships between the different entities. For example, we could create a graph visualization showing how users interact with HP and its products on social media platforms. We could also use this data to analyze trends in user behavior, such as which products are most popular on which social media platforms.Overall, a knowledge graph can be a powerful tool for organizing and analyzing complex data, especially in industries like technology where there are many interconnected entities and relationships to consider.



4. **Provide a dashboard for stakeholders**: You can provide a dashboard that stakeholders can use to query the knowledge graph and get insights into customer sentiments about HP products. The dashboard can include charts and graphs that show trends over time, and allow stakeholders to filter data by brand, model, feature, or sentiment.

The dashboard can help HP improve their customer support and enhance their existing features.

Firstly, the dashboard can include a sentiment analysis chart that shows the overall sentiment of customers towards HP products over time. This can help stakeholders identify trends and patterns in customer feedback and make informed decisions to improve their products.

Secondly, the dashboard can provide filters that allow stakeholders to filter data by brand, model, feature, or sentiment. This can help them understand which products or features are receiving positive or negative feedback and take necessary actions to address the issues.

Thirdly, the dashboard can include a customer support response time chart that shows the average time taken by the HP customer support team to respond to customer queries or complaints. This can help HP identify areas where they can improve their customer support and reduce response time.

Fourthly, the dashboard can provide a product satisfaction rating chart that shows the percentage of customers who are satisfied or dissatisfied with their HP products. This can help HP understand the level of customer satisfaction and identify areas where they can improve their products. **Finally,** the dashboard can also include a customer feedback word cloud that highlights the most commonly used words by customers in their feedback. This can help stakeholders quickly identify common issues or complaints and take necessary actions to address them. **Overall, a** dashboard that allows stakeholders to query the knowledge graph and gain insights into customer sentiments about HP products can be a valuable tool in improving customer support and enhancing existing features. By using the dashboard, stakeholders can make data-driven decisions and take necessary actions to address customer concerns and improve their products.

Dashboard Highlighting Stakeholders Engagement Survey Results

Top Priorities

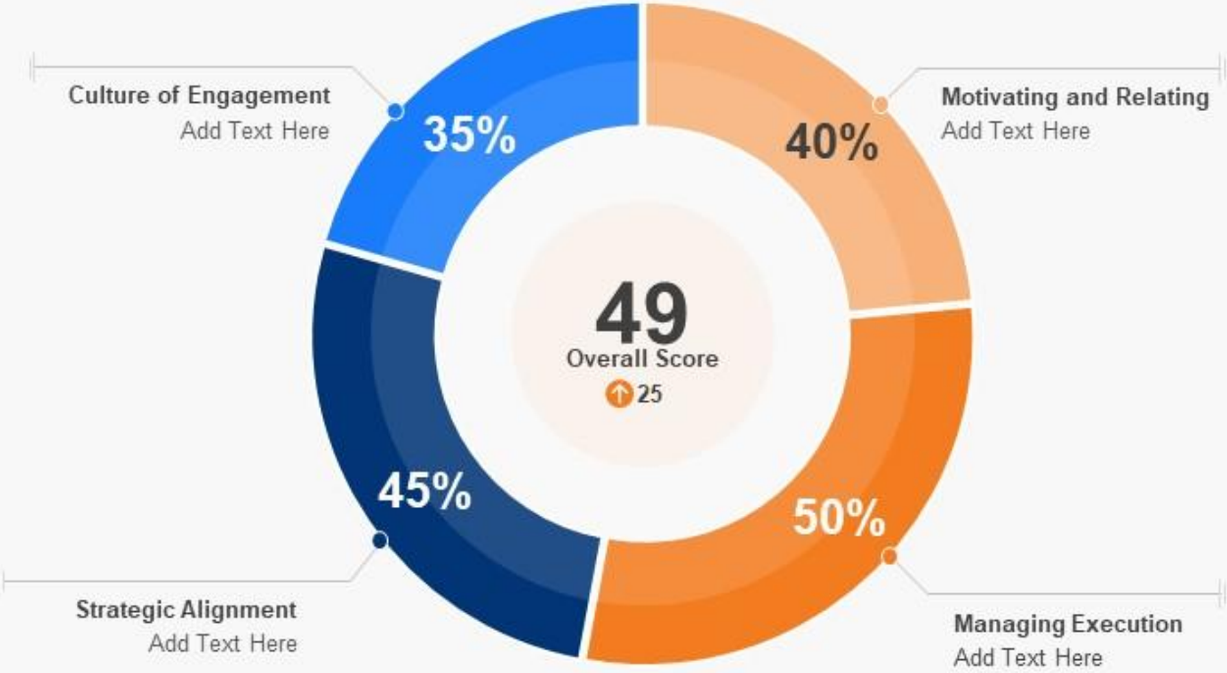
40% Stakeholders are Engaged

50% Stakeholders Engagement in Progress

20% Stakeholders are Disengaged

Organization

Manager



Stakeholders Engagement Project Management Dashboard

This slide covers the project dashboard for engaging stakeholders including task name, milestones and key deliverables, concerns risk and issues, actions and change requests

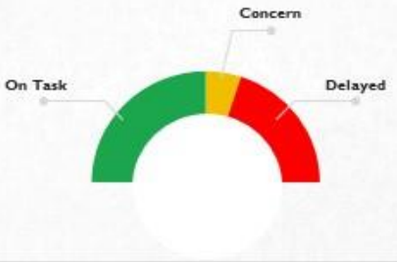
Milestones and Key Dates			
1	Development Complete	On Task	15-Dec
2	Testing Complete	Concern	25- Dec
3	Planning for Change	Delayed	23- Dec

Top 5 Concerns(Risk or Issues)			
1	The Business Requirements have not been signed off	Shum	On Task
2	The Service for the Project have not been commissioned	Support	Concern
3	Add text here	Sammer	Delayed
4	Add text here	QA Lead	Concern

Open Actions and Changes Requests			
1	Pending change request for new login screen	Neel	On Task
2	Tech Architecture need alignment need to be confirmed	Architect	Concern
3	Add text here	AME	Delayed
4	Add text here	Manager	Concern
5	Add text here		

Notes & to do List		
1	Submit Projects	12-Feb
2	Add text here	12-Oct
3	Add text here	12-Nov
4	Update Sponsor on budget changes	11-Dec
5	Add text here	

Key Stakeholder	Add Name here						
ID	Task Name	Owner	Start Date	End Date	Annual	Forecast	Duration	Status
1	Analysis	Neel	2-Oct	29-Oct	35	45	20	
2	Add text here	Kam	10-Oct	28-Oct	20	25	12	
3	Build	Kam	12-Oct	15-Oct	78	75	4	
4	Add Text Here	Zam	11-Oct	25-Oct	0	16	18	
5	Add Text Here	Sujm	15-Oct	6-Nov	0	0	17	
6	Add Text Here	Sum	9-Nov	11-Nov	0	0	3	
7	Add Text Here	Kam	22-Nov	1-Dec	0	0	8	
8	Add Text Here	Zam	2-Dec	7-Dec	0	0	4	
9	Add Text Here	Neel	10-Dec	23-Dec	0	0	10	
10	Add Text Here	Neel	5-Oct	23-Oct	0	53	15	
11	Execute	Rum	6-Oct	27-Oct	0	44	15	
12	Close Project	Rum	25-Dec	25-Dec	1	0	1	
13								
14								
15								



5. **Use the insights to improve product development**: By analyzing the data collected from social media platforms, HP can identify the most common issues customers are facing and use this information to improve product development. For example, if there are a lot of posts about WiFi issues with a specific printer model, HP can prioritize fixing this issue in the next software update.

HP can leverage social media data to improve their product development in several ways. Firstly, they can monitor social media platforms to identify the most common issues customers are facing with their products. By analyzing customer feedback and reviews, HP can identify patterns and trends in customer complaints and concerns, such as poor performance, design flaws, or compatibility issues.

Once HP has **identified the most common issues**, they can prioritize fixing them in the next software update or release. For example, if there are a lot of posts about WiFi issues with a specific printer model, HP can develop and release a software update that addresses this issue. By addressing common customer issues in a timely and effective manner, HP can improve customer satisfaction and loyalty, which can lead to increased sales and market share.

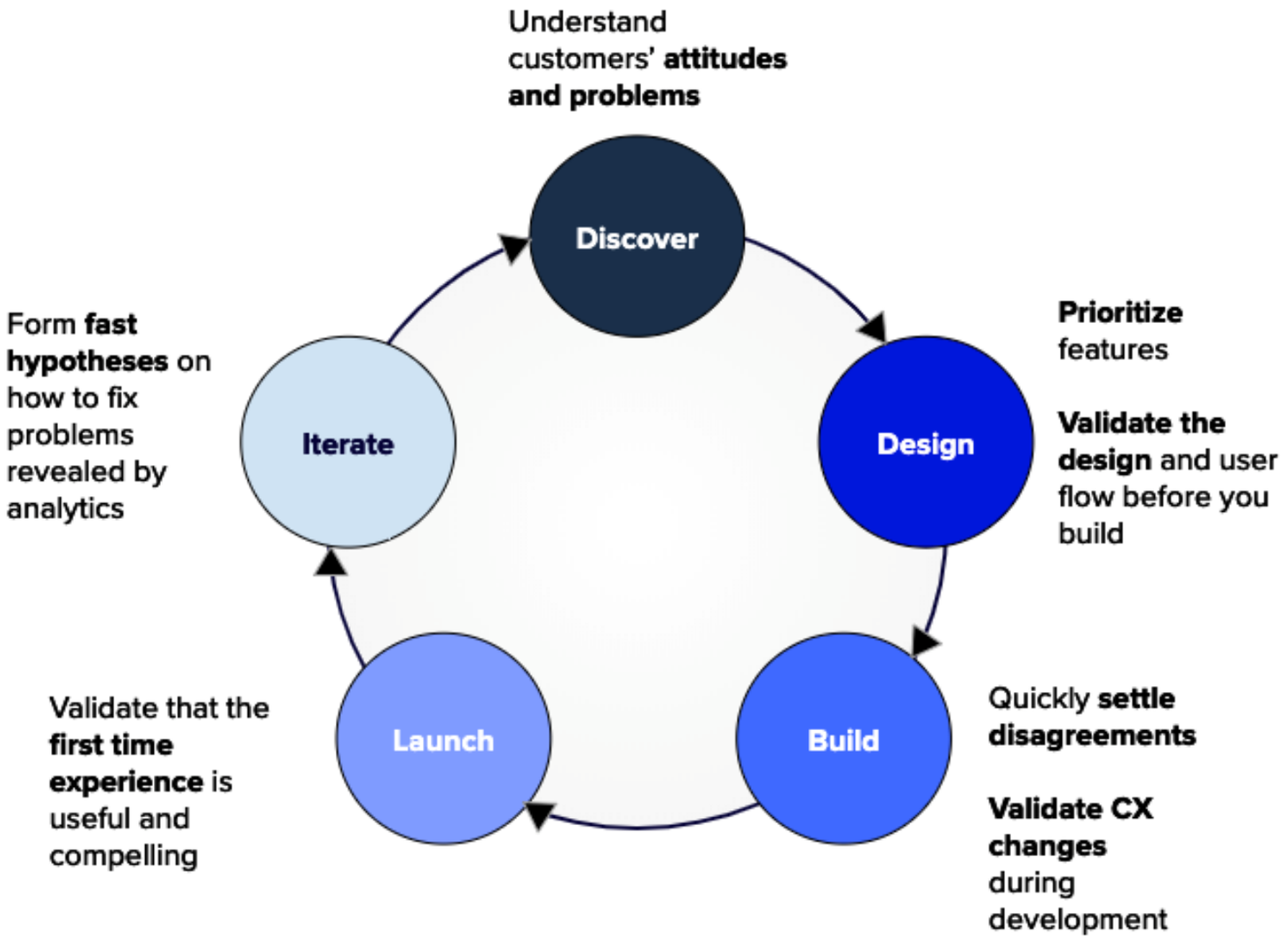
Moreover**, HP can also use social media data to identify customer needs and preferences**, which can inform product development and innovation. For example, if there are a lot of posts about customers wanting a printer with a specific feature, HP can develop and release a new product that meets this need. By staying attuned to customer feedback and preferences, HP can create products that are more likely to meet customer needs and desires, which can lead to increased sales and market share.

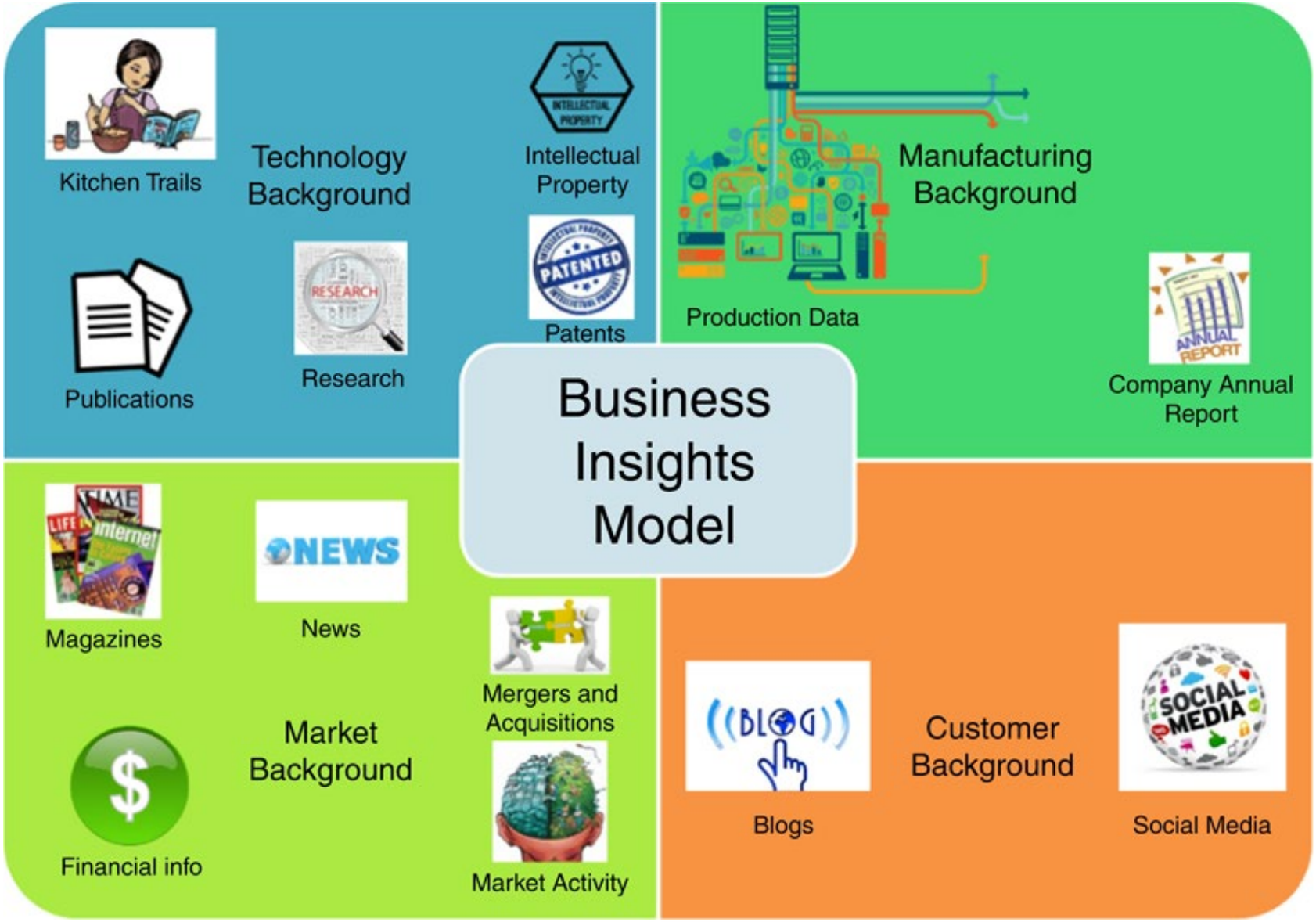
Overall, leveraging social media data to improve product development can help HP improve their **performance in the market, increase customer satisfaction and loyalty, and stay ahead of the competition.** By listening to their customers and developing products that meet their needs, HP can establish themselves as a customer-centric and innovative brand, which can lead to long-term success and growth.

Similarly :

Use the insights to improve customer service: By monitoring social media platforms for posts about HP products, HP can quickly identify customers who are having issues and proactively reach out to offer assistance. This can help improve customer satisfaction and loyalty.

Use the insights to improve marketing: By analyzing the sentiment of posts about HP products, HP can identify what customers like and appreciate about their products. This information can be used to create marketing campaigns that highlight these features and resonate with customers.


Understand customers' **attitudes and problems**
Discover
Prioritize features
Validate the design and user flow before you build
Design
Quickly **settle disagreements**
Validate CX changes during development
Build
Validate that the **first time experience** is useful and compelling
Launch
Form **fast hypotheses** on how to fix problems revealed by analytics
Iterate


Business Insights Model
Technology Background
Kitchen Trails
Intellectual Property
Patents
Publications
Research
Manufacturing Background
Production Data
Company Annual Report
Market Background
Magazines
News
Mergers and Acquisitions
Financial info
Market Activity
Customer Background
Blogs
Social Media