Data Visualisation 2020/21
Element 2: Covid-19 Visualisations
Group ID: Group A

Daniel Harding / Leo Ng / Vincent Lui/ Daniel Pybus/James Corcoran

Introduction

This report will be to discuss the infographic that was produced from investigating the effects of covid-19. It will also discuss the processes that were used to produce the individual graphs and how they were decided upon.

Project Brief

Objectives

A question and answer were sought for “what are the economic effects of covid-19 on the overall economy of the UK?”. In answering this question, it was hoped that it would provide an exploration into the current state of the UK economy and how it has been affected by the challenges and restrictions placed upon it by the pandemic.

Dataset

Several datasets were collated and used to help answer this question. These datasets were the following:

BICS (Office for national statistics [1], 2020) data:
This dataset was gathered from the office of national statistics and contains information from a survey asking businesses various questions regarding the effects covid 19 has had on them. “Responses from the new voluntary fortnightly business survey, which captures businesses’ responses on how their turnover, workforce prices, trade and business resilience have been affected in the two-week reference period.” (ONS ref here)
The data types this data includes are numerical in the form of percentages of responses, as well as numbers of employees or employers that fall into certain categories. Further to this, it contains categorical data in the form of industry sectors.

CJRS (GOV.UK, 2020) data:
This dataset was gathered from the HMRC (Her Majesty's revenue and customs) and contains information regarding the uptake and usage of the job retention scheme by businesses. The types of data this includes the number of unique applicants to the scheme, number of furloughed jobs and the value of the claims received up to the end of the previous Sunday (Ref GOV here).
The data types included in this data are numerical in the form of values of claims and numbers furloughed but also includes ordinal data in the form of date time and categorical data in the form of industry sectors.

MBS (Office for national statistics [2], 2020) data:
This dataset was gathered from the office of national statistics and contains information regarding monthly turnover data for various business sectors. The datatypes this data includes are numerical in the form of revenue values as well as categorical in the form of industry sector.

The joining relationship for these 3 datasets was the industry sector the data belonged to, and as such, this was used to collate the data together.

Alternative Claimant Count (Department for Work and Pensions, 2020) data:
This dataset was gathered from the DWP (Department of Work and Pensions) Stat-Xplore platform. The Alternative Claimant Count is modelled to represent unemployed benefit claimants if Universal Credit had been in place since 2013. Compared to the traditional Claimant Count it provides a much more consistent measure of unemployed claimants overtime and a better indication of workforce changes.

Labour Force Survey (Office for National Statistics, 2020) data:
This dataset was gathered from the Office for National Statistics and contains information relating to the study of employment circumstances in the UK i.e., workforce summary, unemployment, redundancies, earnings, vacancies etc.

Audience

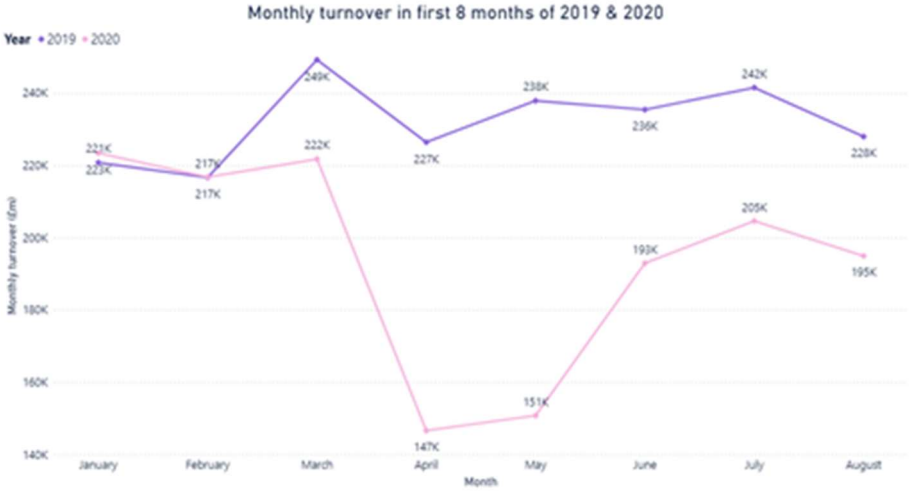
The target audience for this work is small businesses and members of the public. For small businesses, being able to view how well they are faring compared to other businesses in the same sector would potentially allow them a window into the overall state of competition. Further to this, allowing them to view how their industry is holding up in comparison to other areas could allow for small business owners to identify areas they could expand into or avoid.
For members of the public, it will allow them an insight into the overall state of the UK economy and more importantly allow them to see if the industry that they are employed in is struggling. This will be of interest to them as being able to anticipate any potential loss of earnings either through furlough or redundancy will allow members of the public to better prepare for this scenario.

A description of your target audience and the context of the project e.g., what motivates them, what biases do they have, what are they interested in, what is the cultural, community or commercial context?

Data Analysis

Turnover decline and relationship with furloughs

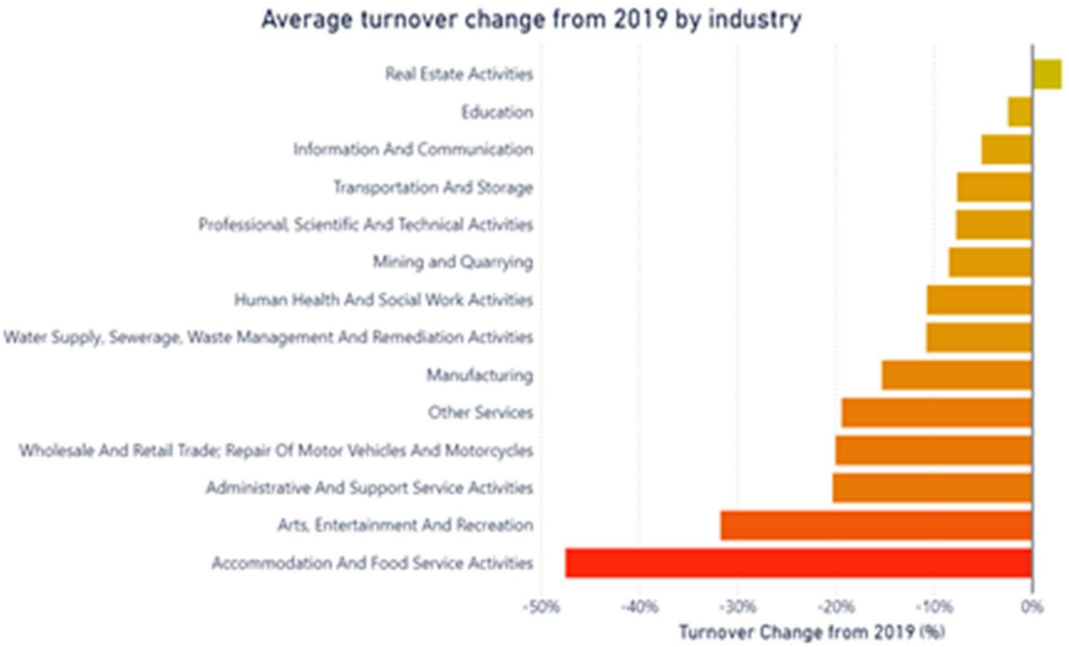
Monthly turnover data from MBS indicated clearly the drop of turnover compared to last year's statistics from March 2020, when the UK was hit by the first wave of Covid-19 pandemic. As the first national lockdown started in late March, a huge turnover decline of up to 37% lower than last year was observed in April and May. Partial recovery was seen from June when the national lockdown came to end on 1st June despite that it was still significantly lower compared to previous year.

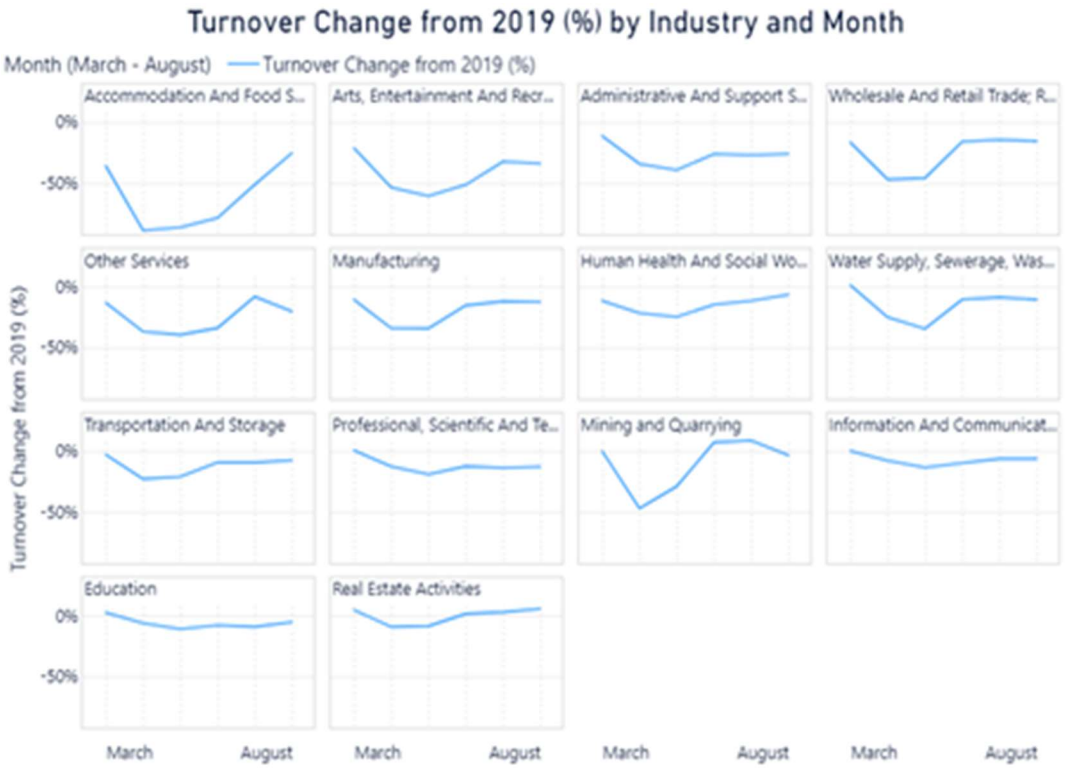


Monthly turnover compare with previous year

Year	Month	Monthly turnover (£m)	Previous Year	Turnover Change from 2019 (%)
2020	January	223,489.70	220,873.60	1.18%
2020	February	216,870.30	216,739.60	0.06%
2020	March	221,847.90	249,327.50	-11.02%
2020	April	146,732.40	226,523.80	-35.22%
2020	May	150,867.90	237,996.90	-36.61%
2020	June	193,052.40	235,534.80	-18.04%
2020	July	204,698.00	241,635.70	-15.29%
2020	August	195,049.60	228,075.30	-14.48%

All industries faced downturn during the pandemic. Accommodation and Food Service Activities were the most affected industry, with up to 89% turnover drop recorded in April and about 48% drop in the first 8 months overall. Other heavily impacted industries included Art, Entertainment and Recreation, Administrative and Support Service Activities, and Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles, which had over 20% decline. While Real Estate Activities reported slight turnover growth from last year, Education and Information and Communication were just barely affected by the pandemic.





Data from CJRS revealed Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles had the highest number of furloughs, followed by Accommodation and Food Service Activities.

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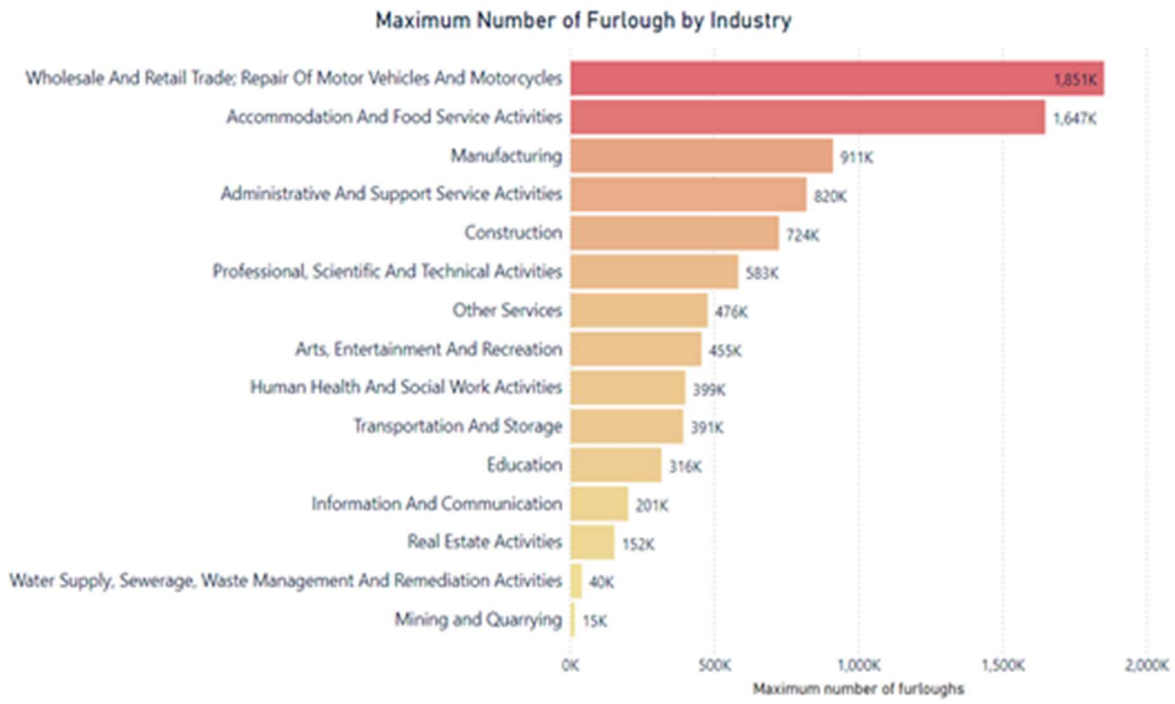
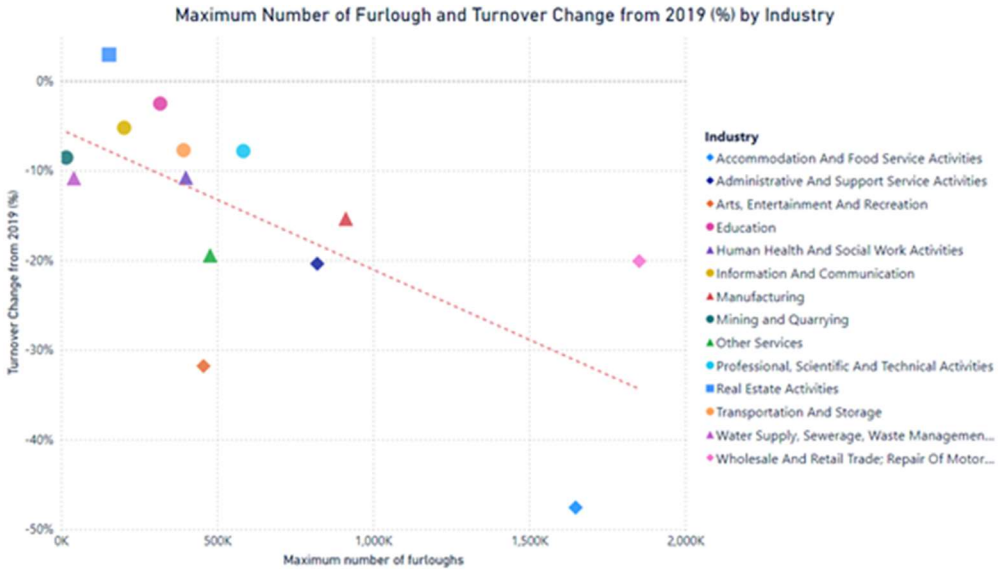


It is not hard to spot that industries with higher numbers of furloughs had a bigger drop of turnover. The relationship between number of furlough and turnover can be clearly seen in the scatter plot below, although the causality is unclear. Business activities might be paused or hindered as employment furloughs happened in order to minimise transmission of virus. However, furloughs could also be due to employers' urge to reduce cost to deal with the low profit situation during the pandemic.



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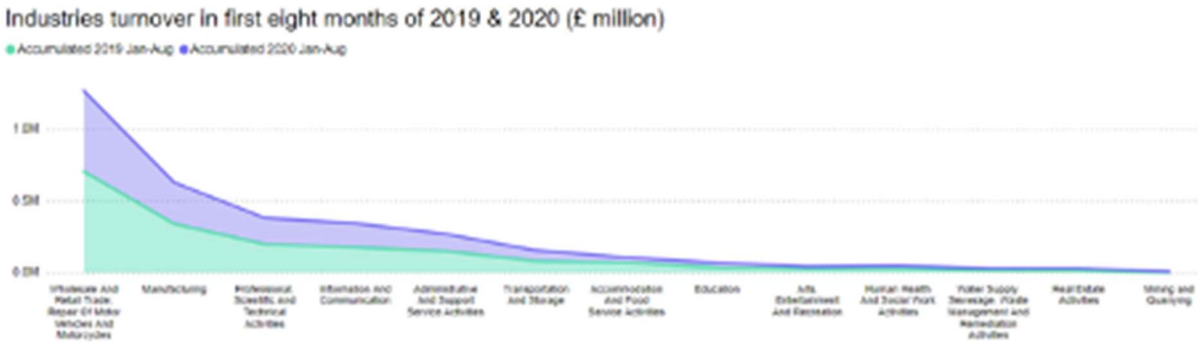
Turnover and cash reserves

Monthly Business Survey indicated that most of the industry's turnover amount dropped in the first eight months compared with 2019 and 2020. Even though the industry of administrative and support service activities had declined 48%, it just occupied a tiny portion of the turnover volume. According to the table as below, it pointed out that the industry of wholesale and retail trade, repair of motor vehicles and motorcycles was the worst during this period. The other industries of manufacturing and professional, scientific and technical activities had a huge impact simultaneously.

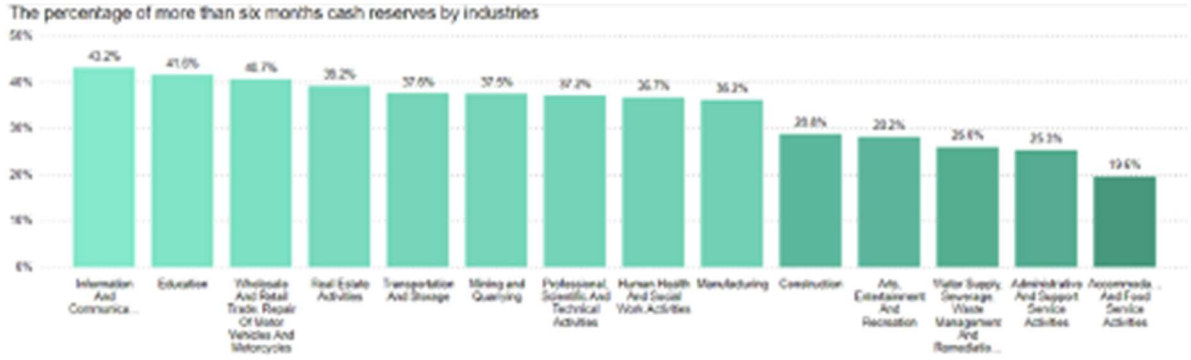


As most industries turnover amounts were declined seriously, so maybe thousands of companies had collapsed in the first eight months in 2020. If those companies desire to survive in this period, it is important that they have enough cash to maintain operations to pay for suppliers, salaries and other company needs. One of the major reasons for company failure is lack of cash flow. So, O'Keeffe mentioned that the control of cash is one of the foremost contributions of finance function to the company. (O'Keeffe, 2010)

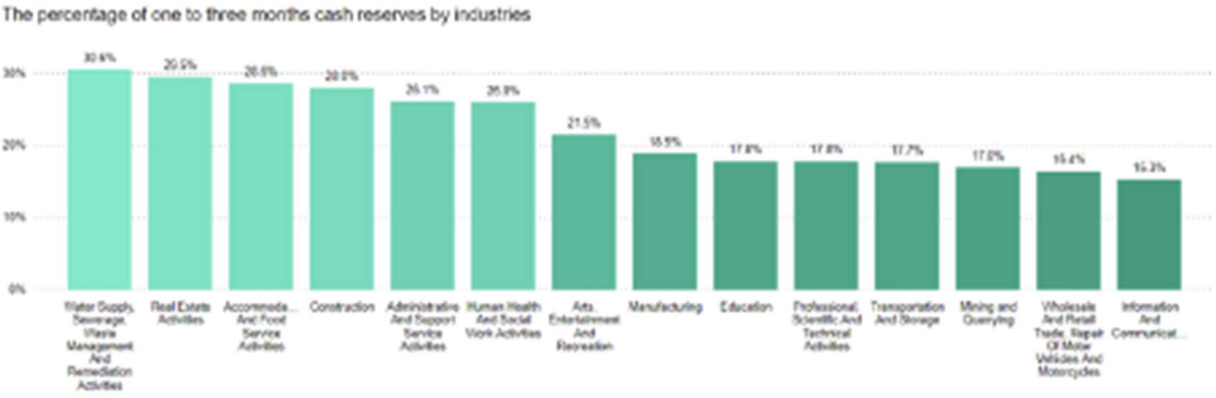
More specifically, the company cannot survive because two adverse issues take place simultaneously. Timothy pointed out that a creditor requires payment in respect of a liability and the company does not have the cash to pay for the demand. The creditor has a right to force the company into bankruptcy. (Timothy, 2012)

In addition, Andrew issued the point that a company fails because it has run out of cash temporarily, then it cannot continue to trade (Andrew, 2005). As a result, cash reserve is one of the key contributions for the company once it faces the crisis, like a pandemic situation.

Based on the chart as above, some industries were faced with the problem of cash flow as they may lack enough cash reserves to maintain a business smoothly. The good thing was most industries had high cash reserves to maintain a business. The chart shows as below:



From the dataset of BICS, it found out that most industries had high cash reserves during pandemic situations. Over 40% of companies in the industries of Information and communication, education, and wholesale and retail trade, repair of motor vehicles and motorcycles, which had more than six months cash reserves to keep a business run continuously.



On the other hand, the industries of water supply, sewerage, waste management and remediation activities, real estate activities, and accommodation and food service activities may lack cash reserves for running a business. Although those companies had one to three months cash reserves, however the pandemic issue may have a huge chance to last for more than three months. As a result, they may have difficulties about the cash reserves for this situation.

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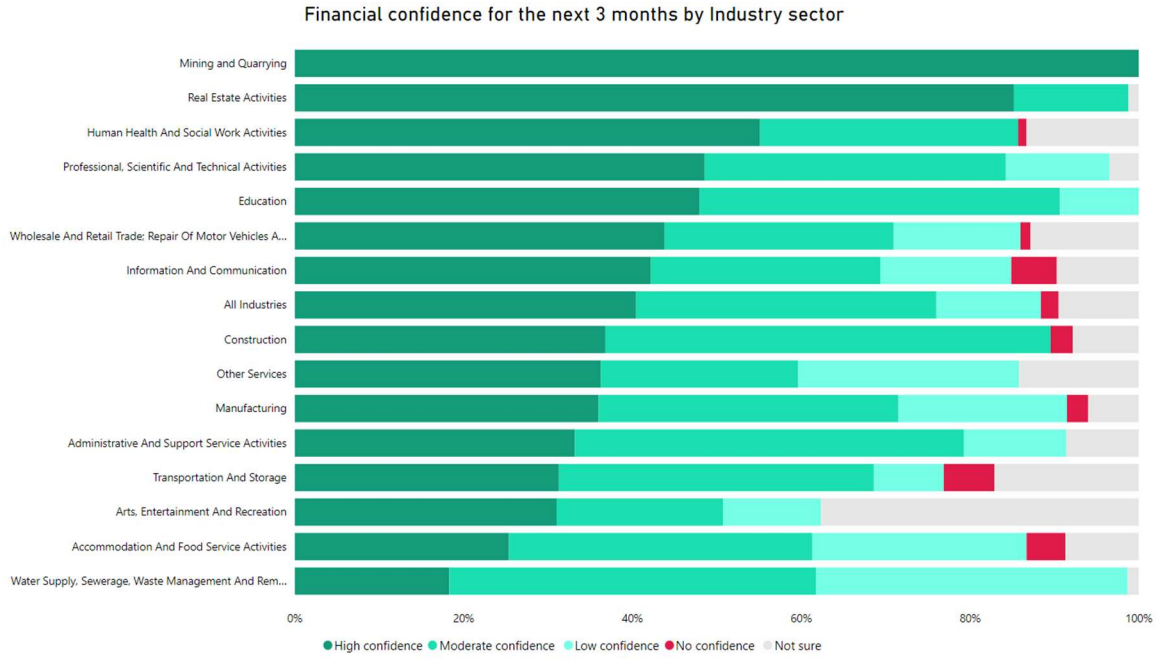
Confidence, furloughs and turnover

Upon cleaning the data down to just the financial confidence results for each industry something interesting was found. All businesses in the mining industry that were surveyed had 100% high confidence of financially surviving the next 3 months as seen in the table below:

Industry	High confidence	Moderate confidence	Low confidence	No confidence	Not sure
Mining and Quarrying	100.00%	0.00%	0.00%	0.00%	0.00%
Manufacturing	36.00%	35.50%	20.00%	2.50%	6.00%
Water Supply, Sewerage, Waste Management And Remedi	18.30%	43.40%	36.90%	0.00%	1.30%
Construction	36.70%	52.60%	0.00%	2.60%	7.80%
Wholesale And Retail Trade; Repair Of Motor Vehicles And	43.80%	27.10%	15.00%	1.20%	12.80%
Transportation And Storage	31.30%	37.30%	8.30%	6.00%	17.10%
Accommodation And Food Service Activities	25.40%	36.00%	25.40%	4.60%	8.70%
Information And Communication	42.20%	27.20%	15.50%	5.40%	9.70%
Real Estate Activities	84.70%	13.50%	0.00%	0.00%	1.20%
Professional, Scientific And Technical Activities	48.10%	35.30%	12.20%	0.00%	3.40%
Administrative And Support Service Activities	33.20%	46.10%	12.10%	0.00%	8.60%
Education	47.70%	42.40%	9.30%	0.00%	0.00%
Human Health And Social Work Activities	55.20%	30.60%	0.00%	1.00%	13.30%
Arts, Entertainment And Recreation	31.00%	19.70%	11.60%	0.00%	37.60%
Other Services	36.30%	23.40%	26.20%	0.00%	14.20%
All Industries	40.50%	35.60%	12.40%	2.10%	9.50%

As the values for each confidence result add up to 100%, it was decided to plot this data on a stacked bar chart:



This chart shows that the Mining, Real Estate and Health and Social industries are all mostly highly confident in financially surviving the next 3 months. The result is interesting, as due to the pressing need for the Health and Social industries during a pandemic, it would be expected that this would result in a higher amount of highly confident businesses for that industry. However, it is possible that this may be offset by factors such as employees becoming ill or other non-front line health services being reduced in priority.

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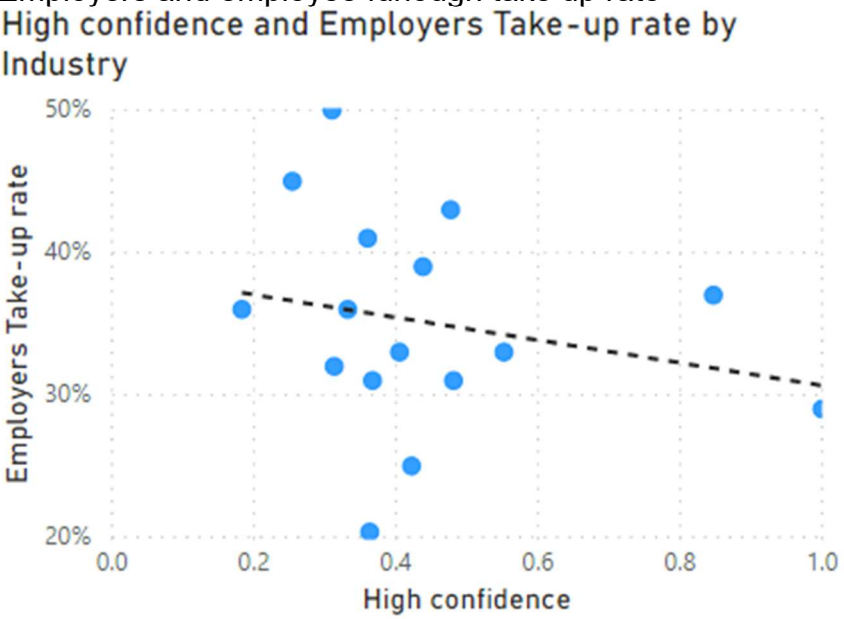
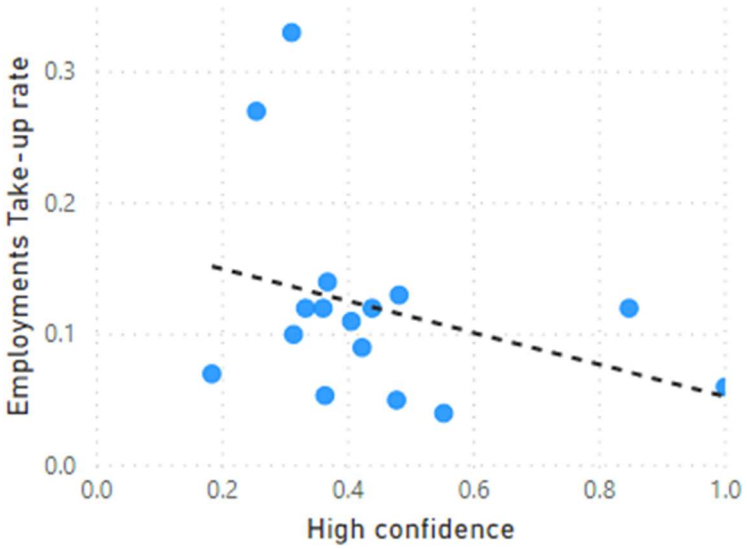
Another interesting result is the real estate industry, however a hypothesis that may go towards explaining this is that investors are seeking safer investments in the form of property as the stock market has been in shock from the pandemic. (Mieszko Mazur et al, 2020)
Near the bottom of the graph is the Arts Entertainment and Recreation industry with the highest number of businesses that are unsure of their confidence to survive the next 3 months. This could be attributed to the lockdown potentially disproportionately affecting this industry when compared with other sectors.
At the bottom of the graph is surprisingly the water industry with the fewest businesses being highly confident. However, there are no businesses within that sector that are not confident and very few unsure.
As a result of all these findings, it was decided that this would be one of the graphs included for consideration in the final infographic.

The next step taken was to try and find something in the dataset that could go towards explaining the previous graphs result. To this end multiple linear regression analysis charts were made to compare industries' high confidence to other variables.

These variables and their regression charts were as follows:

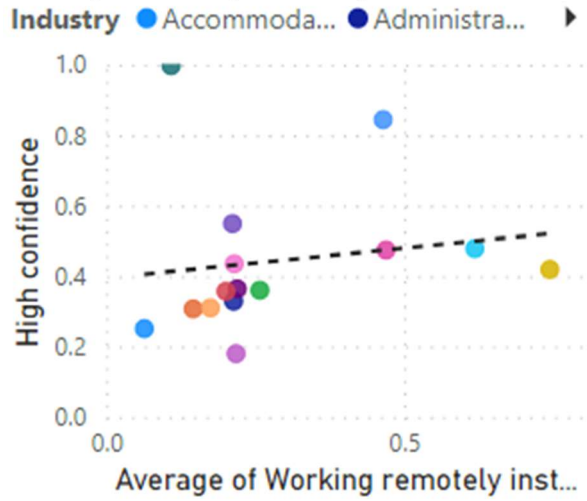
Employers and employee furlough take up rate





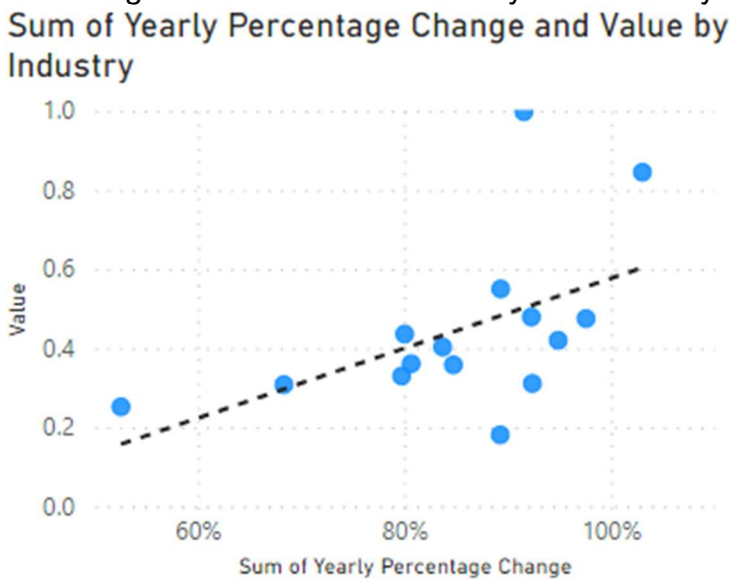
When comparing the high confidence with the employee or employer furlough uptake values, there is a clear negative correlation, more so with the employment uptake. This would appear to make intuitive sense as the more a business must utilise the furlough scheme then it could be inferred that the business is facing more difficulties from the effects of COVID-19.

Average working remotely:

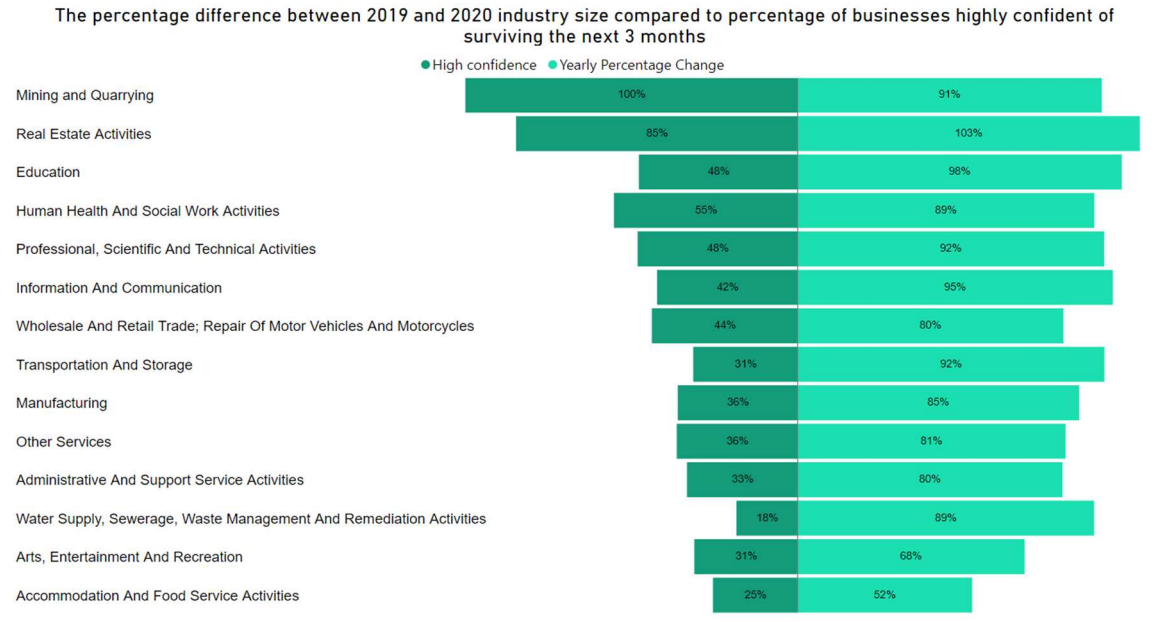


When comparing the average workers working remotely to high confidence, there appears to be a slight positive correlation. This could potentially be explained by some industries facing more difficulties in transitioning to remote working than others. This regression line however appeared to be heavily influenced by the outliers at the extreme end of the high confidence values.

Percentage difference between this year and last year's MBS income value:



When comparing the percentage difference between the businesses MBS income data from last year and this year to the high confidence there was a strong positive correlation. This again would appear to make intuitive sense as a business that has made less money this year would have less high confidence than a business that made more.



When plotting the MBS difference as a tornado chart, a few interesting discoveries were made. First the real estate industry was the only industry to improve upon last year's earnings. This further supports the hypothesis earlier that investors are looking for safer investments. Second that the accommodation and food service industry appear to be struggling the most with the challenges that the pandemic has posed. As a result of all these findings it was decided that this would be one of the graphs included for consideration in the final infographic.

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Workplace Productivity and Working Locations

In the initial discussion for the ICA, there was the potential to build a narrative around the productivity of industries during the pandemic compared to staff working locations. It was thought that productivity would have a direct correlation to the financial security and performance of industries over the period of the pandemic. As the narrative was developed and the infographic designed, it was decided to omit these factors and focus on purely financial impacts to industries. The following section shows the developed charts and tables and the findings from them.

Businesses with industry reported whether they believed productivity had increased, decreased or not changed during the pandemic. Some reported being unsure on changes in productivity.

The following two predictions are made based on the data:

- Higher percentage of furloughed employees will result in decreased productivity.
- Staff working from home will have no correlation with decreased productivity (due to working more efficiently as a smaller team, and managing with a smaller workload).

Industry	Decreased	Increased	No Change	Not Sure
Accommodation And Food Service Activities	3.6%	44.5%	51.2%	0.0%
Administrative And Support Service Activities	23.2%	11.0%	29.4%	36.4%
Arts, Entertainment And Recreation	27.1%	7.2%	60.7%	5.0%
Construction	3.4%	15.3%	80.6%	0.0%
Education	13.0%	3.4%	82.9%	0.0%
Human Health And Social Work Activities	12.6%	0.0%	82.5%	4.4%
Information And Communication	18.0%	11.1%	56.4%	14.5%
Manufacturing	45.6%	5.0%	44.6%	4.9%
Mining and Quarrying	0.0%	0.0%	100.0%	0.0%
Other Services	0.0%	85.0%	14.7%	0.0%
Professional, Scientific And Technical Activities	34.4%	11.4%	46.5%	7.7%
Real Estate Activities	38.9%	2.3%	56.7%	2.0%
Transportation And Storage	25.9%	5.5%	54.8%	13.8%
Water Supply, Sewerage, Waste Management And Remediation Activities	8.4%	1.0%	90.5%	0.0%
Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles	19.0%	9.7%	46.3%	25.0%
Total	**18.2%**	**14.2%**	**59.9%**	**7.6%**

The table indicates that most businesses have reported no change to productivity. Interestingly, the mining industry has reported 100% No Change. This may be due to not asking a sufficient number of businesses within the industry. 18.2% of industries reported a decrease in productivity, while 14.2% reported an increase. This data was visualised on a donut chart.

The following table was produced to organise industry reports by working location. Industries reported whether their staff remained at work, worked from home, were furloughed, were sick, made redundant or other.

Industry	At Work	Work from Home	Furloughed	Isolated/Sick	Redundant	Other
Accommodation And Food Service Activities	62.3%	6.2%	27.4%	1.0%	1.6%	1.4%
Administrative And Support Service Activities	59.6%	21.2%	14.5%	0.0%	1.6%	2.5%
Arts, Entertainment And Recreation	47.6%	14.4%	31.6%	0.0%	2.5%	3.6%
Construction	70.6%	21.8%	5.0%	0.0%	0.0%	1.3%
Education	46.7%	46.8%	5.0%	0.0%	0.0%	0.0%
Human Health And Social Work Activities	71.5%	21.0%	4.1%	1.7%	0.0%	1.4%
Information And Communication	20.0%	74.3%	4.0%	0.0%	0.0%	0.0%
Manufacturing	72.3%	19.9%	5.3%	1.2%	0.0%	0.0%
Mining and Quarrying	81.6%	10.7%	7.1%	0.0%	0.0%	0.0%
Other Services	59.9%	25.6%	9.5%	1.0%	4.0%	0.0%
Professional, Scientific And Technical Activities	29.0%	61.7%	5.3%	0.0%	0.0%	2.4%
Real Estate Activities	46.3%	46.3%	5.3%	1.2%	0.0%	0.0%
Transportation And Storage	64.4%	17.3%	14.7%	1.5%	0.0%	1.3%
Water Supply, Sewerage, Waste Management	68.7%	21.6%	3.0%	0.0%	0.0%	6.0%
Wholesale And Retail Trade; Repair Of Vehicles	69.9%	21.3%	5.9%	0.0%	0.0%	1.2%
Total	**58.0%**	**28.7%**	**9.8%**	**0.5%**	**0.6%**	**1.4%**

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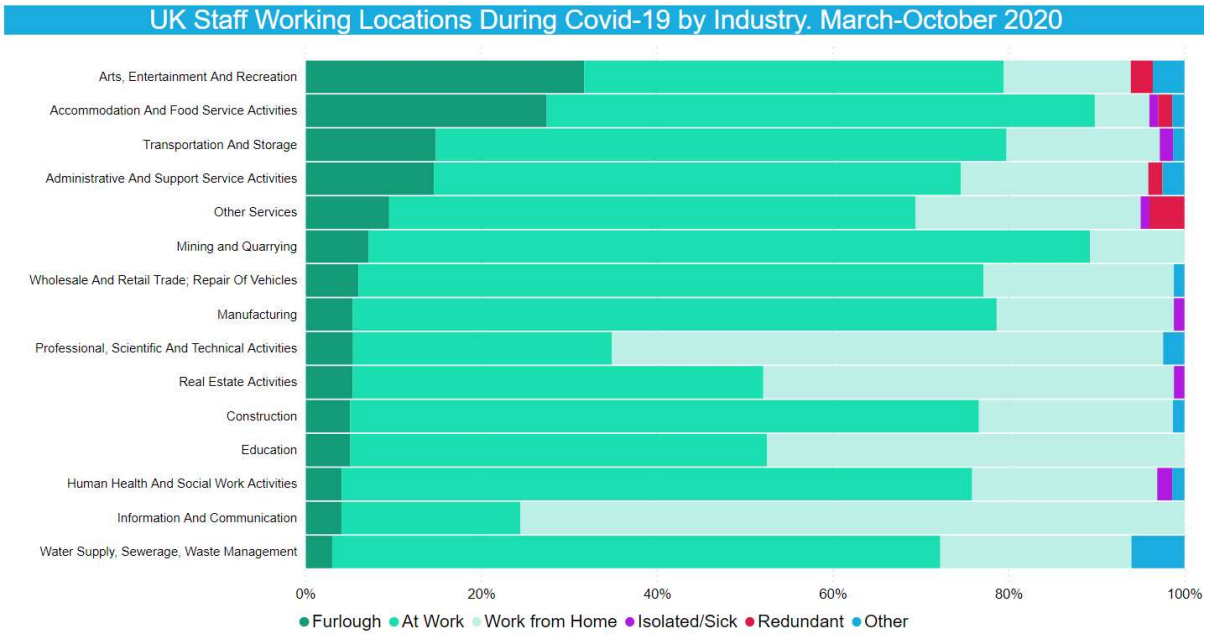
This data was then visually represented in a stacked bar chart:



Furlough vs Productivity

Industry	Furlough	Decreased
Water Supply, Sewerage, Waste Management And Remediation Activities	3.0%	8.4%
Information And Communication	4.0%	18.0%
Human Health And Social Work Activities	4.1%	12.6%
Construction	5.0%	3.4%
Education	5.0%	13.0%
Professional, Scientific And Technical Activities	5.3%	34.4%
Real Estate Activities	5.3%	38.9%
Manufacturing	5.3%	45.6%
Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles	5.9%	19.0%
Mining and Quarrying	7.1%	0.0%
Other Services	9.5%	0.0%
Administrative And Support Service Activities	14.5%	23.2%
Transportation And Storage	14.7%	25.9%
Accommodation And Food Service Activities	27.4%	3.6%
Arts, Entertainment And Recreation	31.6%	27.1%

The theory that furlough would negatively impact productivity has proven false in this instance. Though some industries with a higher percentage of furloughed employees have reported lower productivity, the trend is not definitive enough to draw a positive correlation.

Working from Home vs Productivity

Industry	Work from Home	Decreased
Accommodation And Food Service Activities	6.2%	3.6%
Mining and Quarrying	10.7%	0.0%
Arts, Entertainment And Recreation	14.4%	27.1%
Transportation And Storage	17.3%	25.9%
Manufacturing	19.9%	45.6%
Human Health And Social Work Activities	21.0%	12.6%
Administrative And Support Service Activities	21.2%	23.2%
Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles	21.3%	19.0%
Water Supply, Sewerage, Waste Management And Remediation Activities	21.6%	8.4%
Construction	21.8%	3.4%
Other Services	25.6%	0.0%
Real Estate Activities	46.3%	38.9%
Education	46.8%	13.0%
Professional, Scientific And Technical Activities	61.7%	34.4%
Information And Communication	74.3%	18.0%

The prediction for this metric was correct – working from home did not have a positive or negative correlation on productivity.

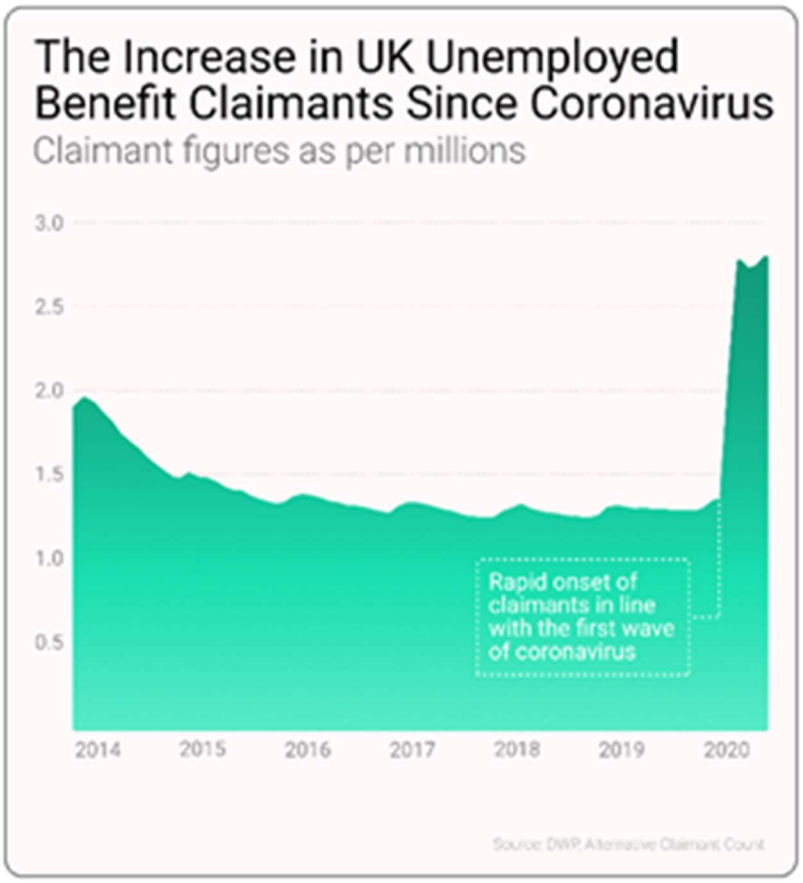
Further Discussion

Had the group decided to further analyse the impact productivity has on turnover/profit, the following areas could be investigated:

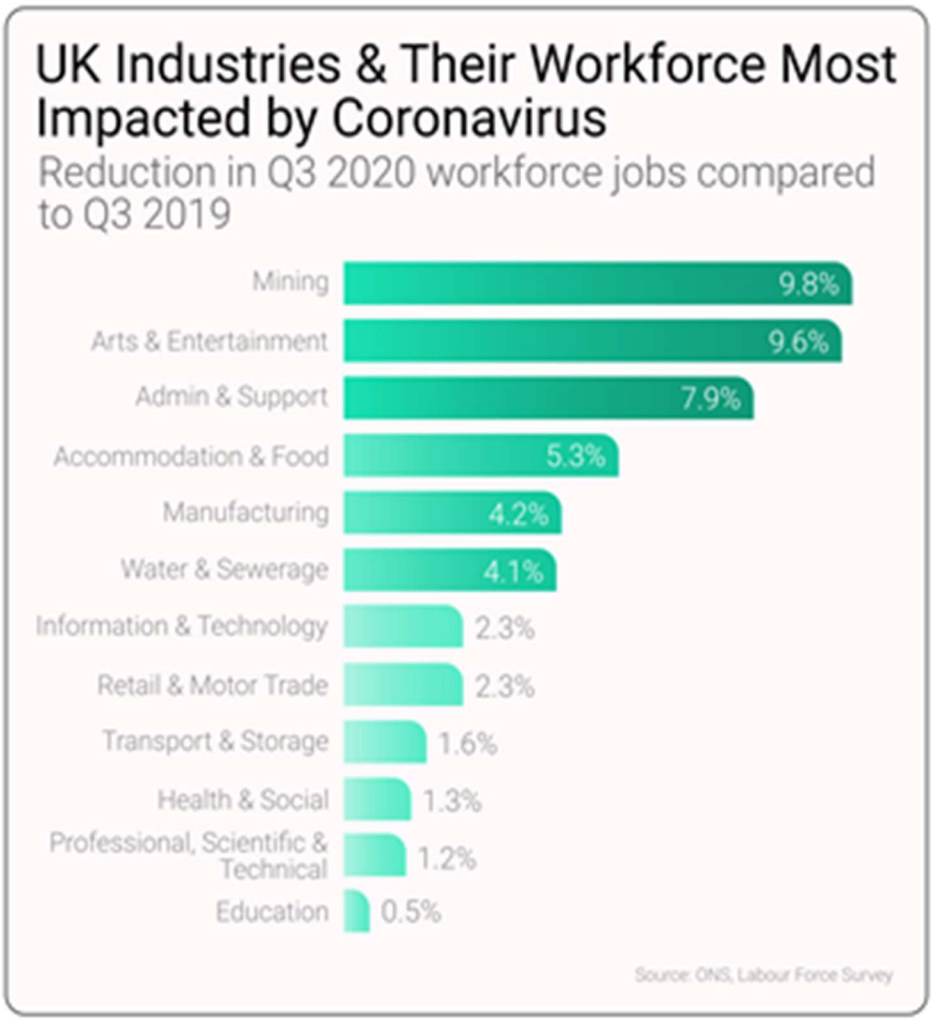
- Is there a correlation between decreased productivity and decreased profit? Under normal circumstances it is assumed the two would directly correlate, but during the pandemic the fluctuations in purchasing and services offered have been affected in unpredictable ways.
- Has a move to working from home shown that many jobs do not need to take place in the workplace, and could this practice actually improve productivity and therefore profitability?

Benefit Claimants & Workforce Reduction

Historically from 2013 when the Alternative Claimant Count was introduced the number of unemployed benefit claimants have been relatively steady with small seasonal fluctuations each year. However, when looking at 2020 there was a very sharp increase in claimants from April which coincides with the initial lockdown and wave of Coronavirus. To note, the latter is suggestive in that there is no direct evidence to explicitly prove the cause for said increase in claimants.



Included in the Labour Force Survey are the Workforce Jobs estimates, with the latter being the preferred method of measuring short-term employment change in industry. From initial analyses it was clear that from Q1 2020 there was a downward trend in reduction of workforce jobs. In addition, it was evident that specific industries had greater reductions than others, some correlating with data in MBS/CJRS datasets. To ensure said data aligned with the remaining work, the Q3 were compared between 2019 & 2020.



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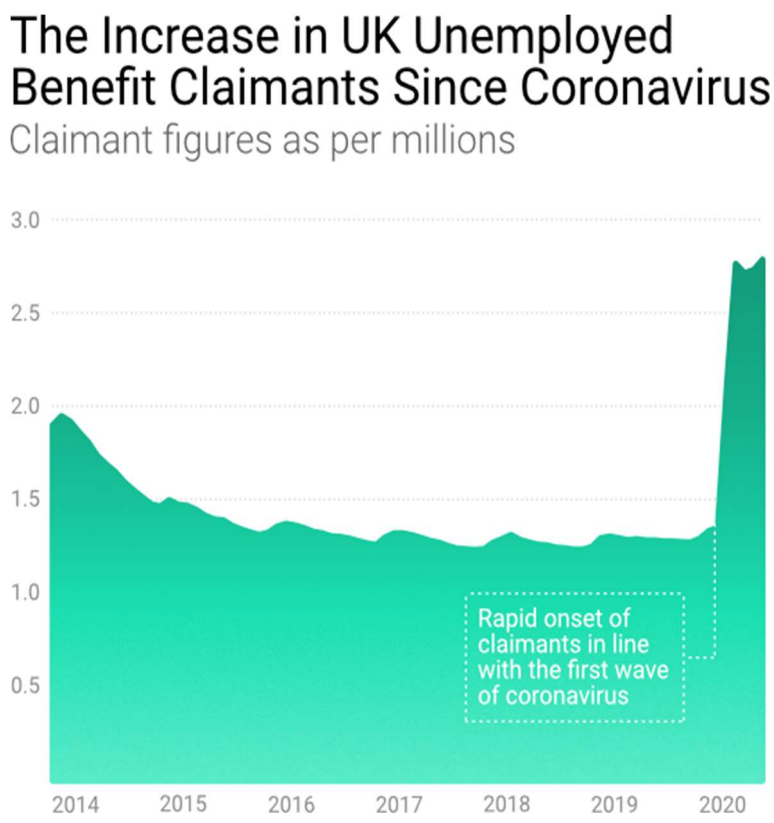
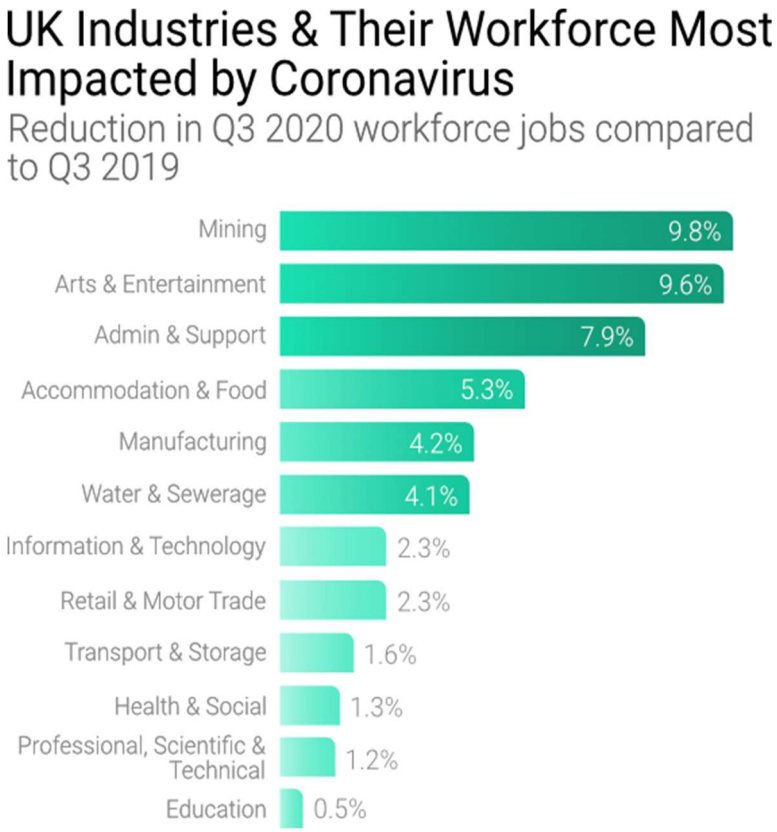
Data Narrative

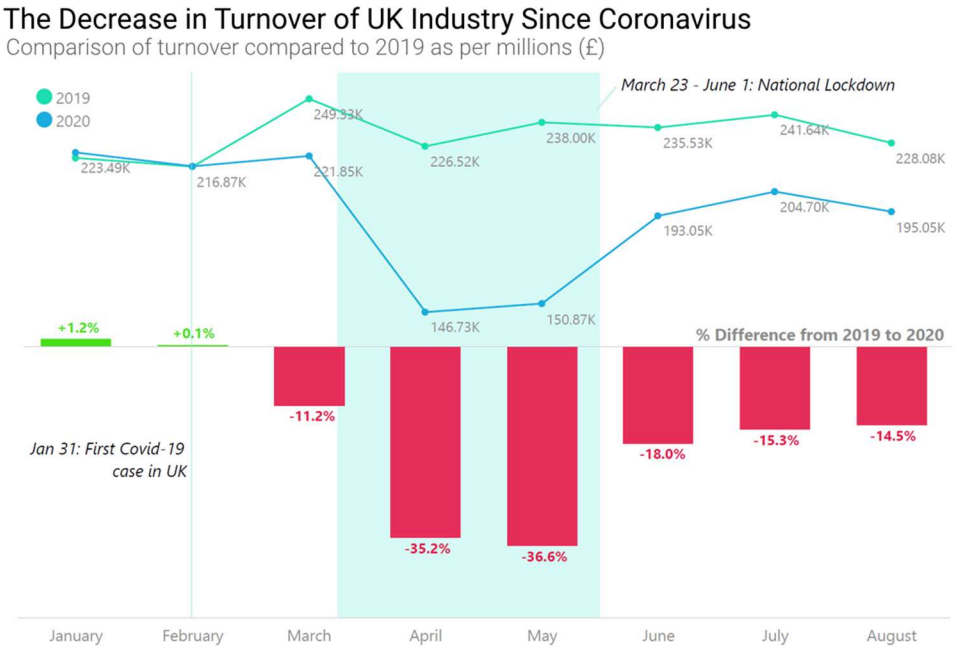
The narrative for the infographic was centred around the financial impact of COVID-19 on businesses. To this end, the following were selected as they directly represented financial data from the selected data sets.



The reason for this graph's inclusion is that it represents the increase in benefits claims which will be directly related to people's financial situations. Further to this, it shows a sharp increase in the amount of benefit claimants during the pandemic timescale.



The reason for this graph's inclusion is that it shows which industry has been most greatly affected by the COVID outbreak. This coupled with the previous graph, provides an indication as to which industries are struggling to survive financially.



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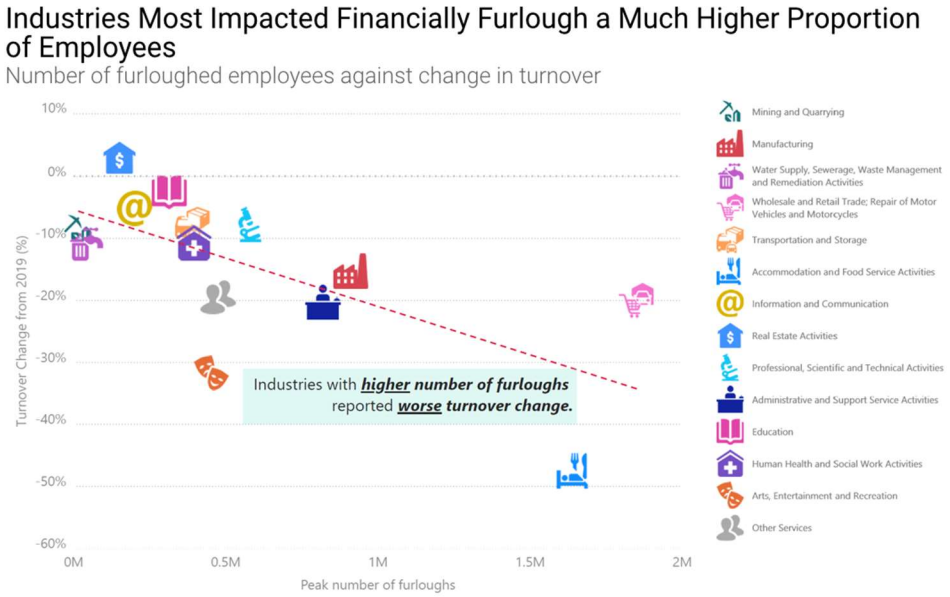
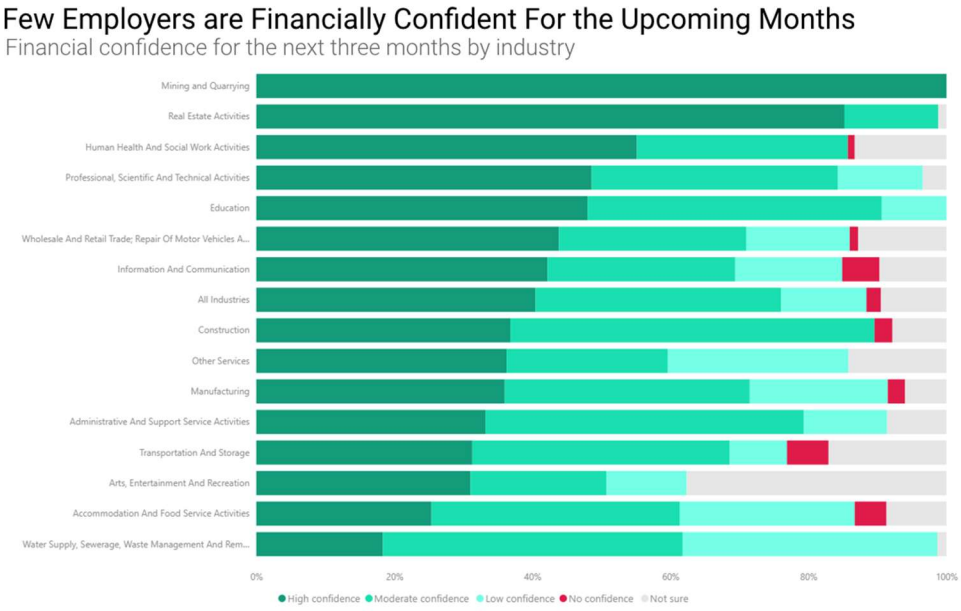
The reason for this graph's inclusion is that it provides an overview as to how businesses across the UK have performed when comparing last year's financial figures to this year. This graph highlights the peak of the financial damage done during the march lockdown.



The reason for this graphs inclusion is that is allows for insight into which industries have been taking the most advantage of the furlough scheme. It could be inferred that the more a business needs to utilise the furlough scheme the more the business is struggling financially.



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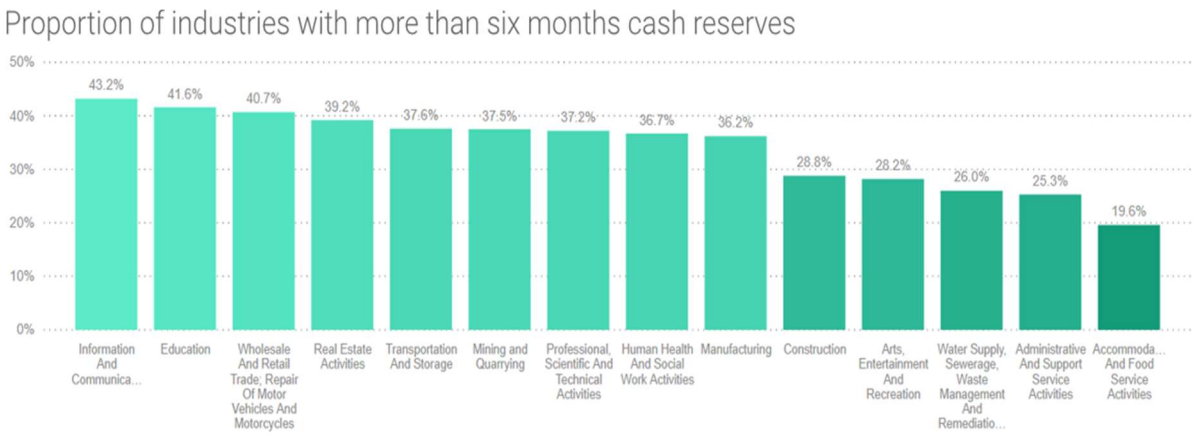
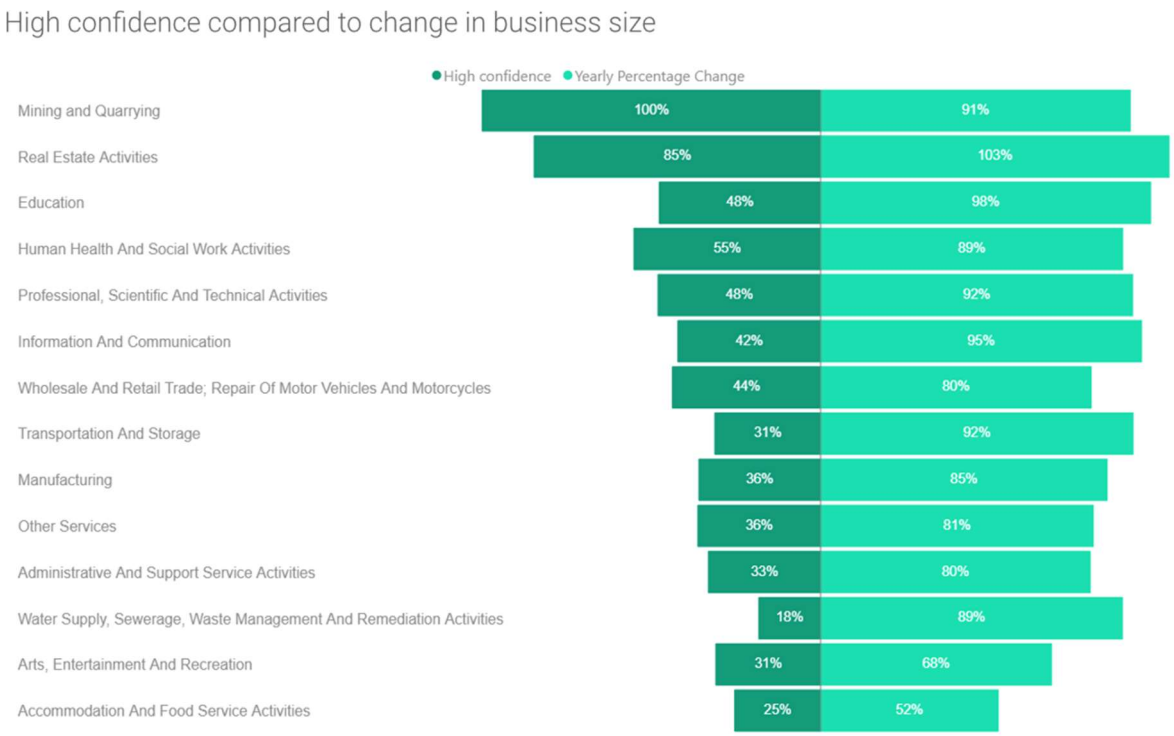
The reason for this graph's inclusion is that it shows the proportion of businesses' confidence in financial survival across all industries. This allowed for direct comparisons between industry confidence. In combination with the other graphs, it can provide further insight into which industries are struggling financially the most.



The reason for this graph's inclusion is that it directly relates to the previous graph as well as directly showing which businesses possess ample cash reserves for the next six months. This in combination with the previous graphs, allows for insight into how imminently financially tenuous a position, businesses are in.

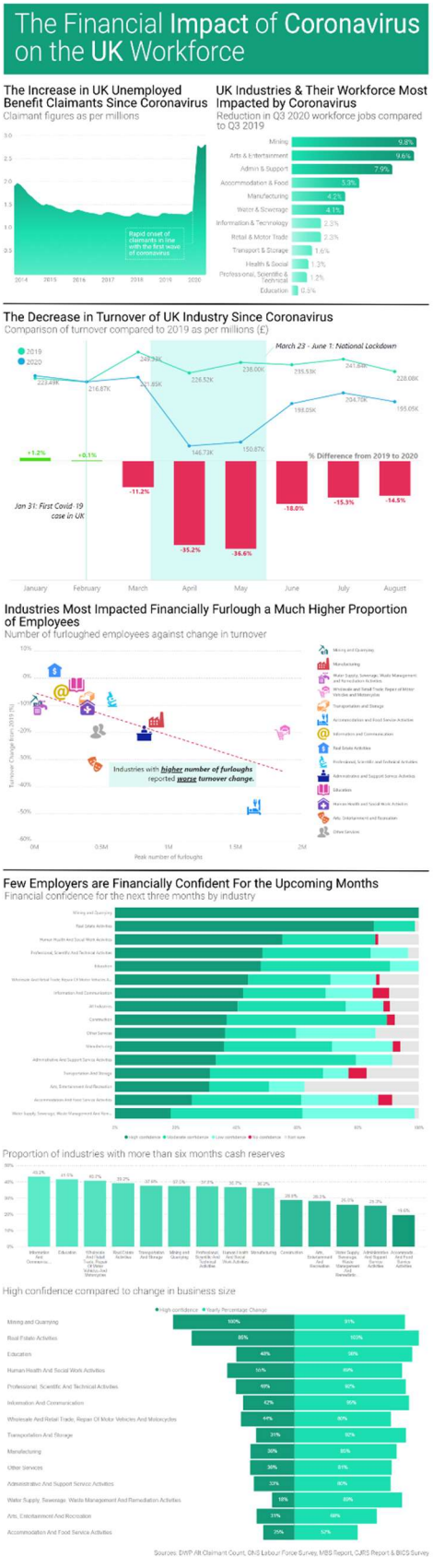


The reason for this graph's inclusion is that it provides an indication as to how the proportion of high confidence in a business's financial situation is affected by the difference in business size from last year and this year. This is directly to some of the previous graphs and as such provides additional context. Further to this, it also shows that the real estate industry was the only industry to experience growth during 2020.

It was decided that the rest of the graphs mentioned in the data analysis section were not to be included, as while they displayed interesting data, they did not match the narrative that was trying to be portrayed by the infographic.

Overall, the narrative that is being displayed by the choice of graphs is that businesses are all encountering difficulties in one way or another because of Covid’s effects on the economy.

Data Representation



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Critical Reflection

The following quality criteria will be used in order to evaluate the infographic:
1) Emphasis
2) Use of gestalt principles
3) Use of aesthetics for engagement
4) Visual integrity
5) Credibility

With regards to emphasis used within the infographic, the first instance this is used is within the title as several key works have been made bold in order to draw the user's attention to them. Another use of emphasis occurs within the use of colour, whereas most of the graphs contain greens and turquoise, areas that are of significance have been highlighted in red as an example of editorial salience.
With regards to the use of gestalt principles, the infographic primarily uses the following principles of proximity and enclosure. These principles are used with the positioning and partitioning of the individual graphs in order to help convey the narrative. This was done by placing the graphs that were more closely connected next to each other and by separating graphs that moved into a different angle with a border as this would present an edge crossing problem for the users, indicating that the next set of graphs covers different area (A. Rusu et al, 2011).
With regards to use of aesthetics for engagement, the infographic uses a consistent colour theme to represent the data. Further to this, the titles of the graphs are either in black when the graphs relate to a new area or grey in order to encourage an association from the user. Another use of colour is as mentioned earlier, is the use of red in order to draw the user's attention to certain areas of the graph.
With regards to visual integrity, the graphs and the infographic contain little in the way of chart junk (Tuft E, 2001). The addition of the lines partitioning the graphs will have added to the chart junk, but this was used as editorial salience. The graphs themselves have a high data ink ratio. Further to this, the graphs chosen all follow the principle of proportional ink as set out by Bergstrom and West (2016)
With regards to Credibility, the data for each of the graphs comes from either the ONS (Office of national statistics) or the DWP (Department for work and pensions). As such the data being represented should be credible. The graphs contain a high data ink ratio but not so high that it falls into the trap of inadvertently lying with the visualisations as discussed by Darrell Huff (Huff D, 2020).

Overall, the infographic provides an answer to the brief's question of "what are the economic effects of covid-19 on the overall economy of the UK?". It does this with particular focus on the financial impact of COVID.

Project Work Plan

Date	Duration	Assignee	Task
September	2 Weeks	Everyone	Find dataset
October 1-15th	2 Weeks	Everyone	Find interesting result in dataset
October 16-30th	2 Weeks	Everyone	Create 2 graphs for consideration
November 1-15th	2 Weeks	Everyone	Write up Data analysis section for each of our 2 graphs
November 16-30th	2 Weeks	James Corcoran	Create the infographic
January 1-14th	2 Weeks	Everyone	Finish off the report

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