ABSTRACT

Estimates of the future demand for transformers have been revaluated due to the global COVID-19 pandemic and related economic recession. The analyses have been made for generator transformers, transmission transformers and distribution transformers. Studies show that the electrical capacity installation growth is stable for the last 30 years despite the fluctuations in the global economies which leads to the conclusion that there will be no dramatic disruptions on the transformer markets.

KEYWORDS

COVID-19, GDP, installed capacity, prediction, transformer market

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Previous, pre-COVID-19 analyses and estimates projected the average yearly growth rate (CAGR) of the transformer's market to be 3.48 % up to 2028

Transformer demand from 2019 to 2029 and beyond

The impact of Covid-19 on future markets

The purpose of this analysis is to assess the future of the global market for transformers following the global pandemic that has swept the world since the start of 2020. Our original estimates were produced during the last quarter of 2019 and therefore pre-dated the pandemic. The scale and ferocity of the spread of the virus became clear during the first and second quarters of 2020, and the disruption to life worldwide is becoming clear. This has prompted a re-examination and a re-calibration of the future scenarios that were being proposed at the start of 2020.

Much has changed in the period between December 2019 and the fall of 2020 and the ramifications of those changes in a few short months will be present – at least for the next 10 years - if not longer.

Pre-Covid-19 the future demand for GSU (generator step-up) transformers was estimated to grow at 3.48 % through to 2028; details are shown in Table 1.

After GDP drop of 5 % on the worldwide level during 2020, The International Monetary Fund estimates recovery in 2021 and the growth of 4 %

These estimates produced in Q4 2019 need to be reviewed in order to estimate demands following the disrupted period and its impact on future growth. The generator step-up transformer demand differs from other transformers' utilities demand principally because it is capital expenditure-driven and closely linked with GDP growth, whereas the system and distribution transformer segments are disproportionately affected by operational expenditure in addition to capex. The change in the forecasts for these segments are discussed later in this article, but firstly it is logical to reset the GSU forecasts.

The original forecast CAGR for generating capacity from 2018 to 2028 was estimated to be 3.48 %. This took into account the relatively low growth rates in fossil and nuclear capacity and the high growth rates expected for renewable technologies. When computed to include the replacement of redundant plant during the forecast period and the power factor effect on generating MVA, we calculated that this would result in a total 10-year demand of 4,238 GVA of GSU capacity.

The International Monetary Fund has recently published a June 2020 update to the World Economic Outlook series of publications. This edition revised the projected growth and GDP forecasts from the earlier April edition downwards. The details by major regions are shown in Table 2.

Fig. 1 graphically illustrates the short-term forecasts.

Given that most generating plant development projects are planned several years ahead of commissioning and that GSU transformers are ordered over a year in advance of grid synchronisation on the face of it, the industry activity should be able to "bridge the gap". Projects in design or in construction phases may be subjected to delays caused by Covid-19 restrictions, but it looks as though GSU transformer demand may not be impacted too greatly. However, the future – and these forecasts – are far from certain and will depend on a number of factors, including speed of recovery, second or subsequent virus waves, government spending / debt, world commodity and oil prices, etc. The June review does explore some of these scenarios, and as a result, the recovery illustrated in Fig. 1 may be delayed but up to 3, 4 or 5 years into the future. In this case, the ability of the industry to "bridge the gap" will definitely be compromised to the point that if global electricity demand does not increase, the need for new generating capacity will also largely disappear.

On the basis that if we do not know what the future will be, let us look back to see if history can provide any valid indication that will help with the analysis. There have been many recessions, conflicts and periods of negative growth, but only a few during the period of time when electricity has been a major utility product. The 1914–1918 war and the Wall Street depression of the 1920s were globally devastating but probably too far back in time to shed light on the 21st centu-

Table 1. Forecast global capacity totals 2018 to 2028 by type GW

Capacity type	2018	2028	Increase in capacity GW	2028 % of total	CAGR %
Nuclear	360.4	395.4	35.0	4.1 %	0.93 %
Fossil	4,258.9	5,323.0	1,064.1	54.9 %	2.26 %
Hydro	1,123.2	1,383.5	260.3	14.3 %	2.11 %
Renewable	1,147.3	2,593.9	1,446.7	26.8 %	8.50 %
Of which:					
Wind	505.3	1,064.5	559.2	11.0 %	7.7 %
Solar	466.2	1,294.2	828.0	13.3 %	10.8 %
Biomass	131.8	214.8	83.0	2.2 %	5.0 %
Total additional capacity	**6,889.8**	**9,695.9**	**2,806.1**	**100.0 %**	**3.48 %**

Table 2. GDP estimates 2017 to 2021

Real GDP estimates and forecasts 2017 to 2021					
(Percent change from previous year)	**2017**	**2018**	**2019e**	**2020f**	**2021f**
World	3.3	3.0	2.4	-5.2	4.2
Advanced economies	2.5	2.1	1.6	-7.0	3.9
United States	2.4	2.9	2.3	-6.1	4.0
Euro Area	2.5	1.9	1.2	-9.1	4.5
Japan	2.2	0.3	0.7	-6.1	2.5
Emerging market & developing economies	4.5	4.3	3.5	-2.5	4.6
East Asia and Pacific	6.5	6.3	5.9	0.5	6.6
China	6.8	6.6	6.1	1.0	6.9
Europe and Central Asia	4.1	3.3	2.2	-4.7	3.6
Latin America and the Caribbean	1.9	1.7	0.8	-7.2	2.8
Middle East and North Africa	1.1	0.9	-0.2	-4.2	2.3
South Asia	6.5	6.5	4.7	-2.7	2.8
Sub-Saharan Africa	2.6	2.6	2.2	-2.8	3.1

Source World Bank

ry. Similarly, the 1973 oil crisis, whilst it did result in a reassessment of fuel strategy in many countries, it happened at a time when the total global GDP was less than 25 % of the current USA total today and happened well before China became the major global financial power that it now is. So, the nearest comparison from which we might learn is the 2008 financial crash that, albeit for very different reasons, constitutes a similarly sudden and globally devastating event.

Fig. 2 shows the year-on-year growth in global GDP and the growth of the global

Based on the data for the 2008 recession, we can see that the global capacity installation continues to grow even during the period of the negative GDP growth

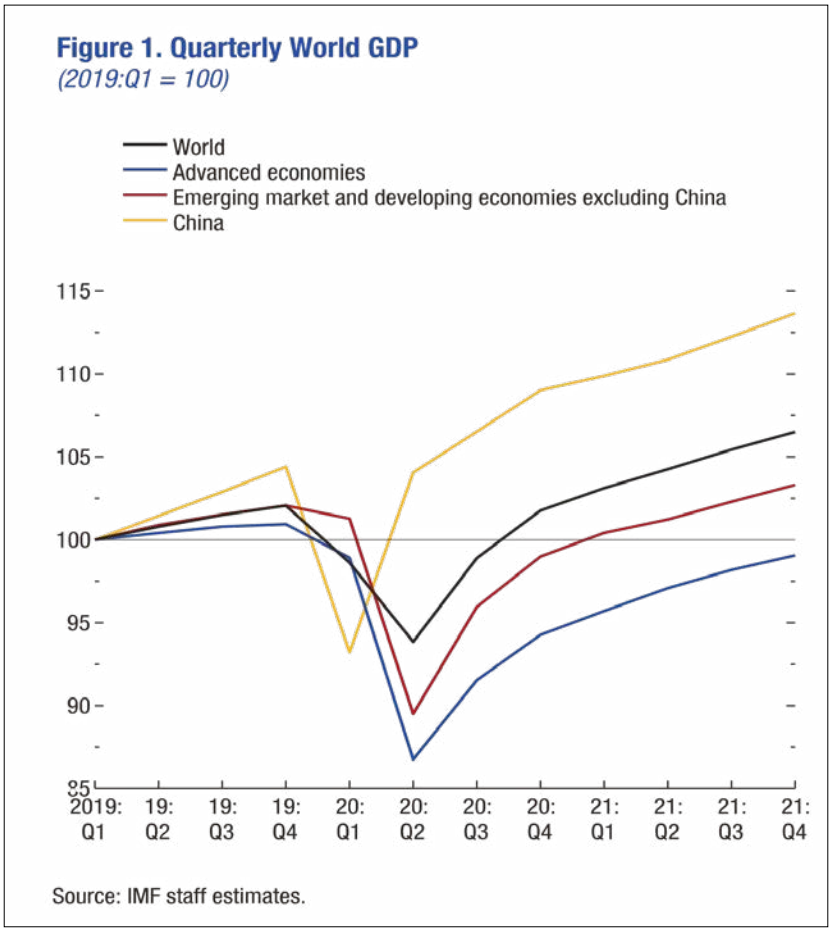

Figure 1. Quarterly world GDP by IMF

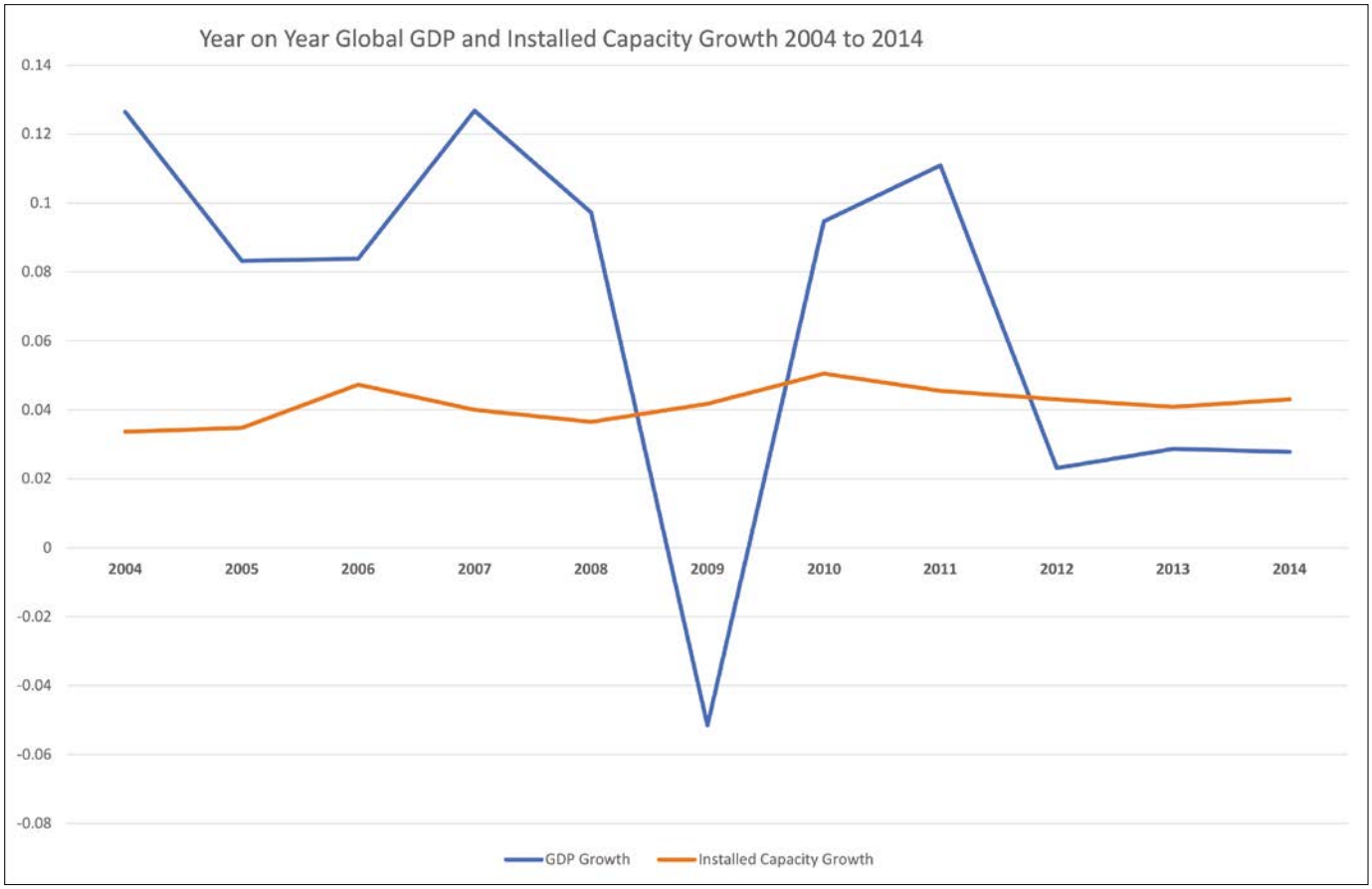

Figure 2. Global GDP & installed capacity growth rate comparison from 2004 to 2014

The global growth of the installed capacities is stable during the last 30 years and has a rate between 1 % and 5 %

installed generating capacity for the period from 2004 to 2014.

The chart in Fig. 2 shows the fall in GDP growth, which started in 2008 and then more dramatically to -5.2 % in 2009. There was a bounce back in 2010 and 2011 but then reduced to a little over 2 % in the following years. Interestingly, the global installed generating capacity continued to grow at over 4 % each year from 2008 through to 2010 when it breached the 5 % level and then remained above 4 % for the remainder of the period to 2014 (for the recorder continued above 4 % until 2018). The recovery of the world's financial system took nearly a decade, and some would say that it has still not fully recovered 12 years later.

It is important to see if this trend is long- or short-term because it may be expected that there will be non-related peaks and troughs in both series. The chart in Fig. 3 provides a comparison over a longer time frame from 1980 to 2019.

The chart covers a period of nearly 30 years, and it can be seen that the more extreme peaks and troughs that occur in global GDP growth are not reflected in the installed generating capacity rates over the same period. In fact, the rate of growth in global installed capacity has remained relatively stable, growing between 1 % and 5 % for the last 30 years. It must be borne in mind that this is installed capacity growth and it does not include replacement plant; a segment which will also be growing in line with the increases in installed capacity – starting at levels thirty years prior to 1980 (see earlier columns for the rationale of replacement rates).

It is fair to conclude, without going into a more detailed examination of the factors that will impact the post-Covid world, that short of the decimation of the global population, or total economic stagnation, the global installed capacity is likely to continue to grow at between 1 % and 5 % for the next 20 to 30 years.

The overall growth rate proposed in January 2020 of 3.48 % between 2018 and 2028 is likely to be valid with respect to the GSU transformer segment of the market. In the immediate short-term period from 2018 to 2023, the growth is almost set in stone due to the long-term nature of the contracts and development projects. At most, there may be a percent below that level. The period from 2023 to 2025 should hold up to the original estimate, but again it may be slightly impacted by decisions deferred during the first half of 2020. However, the effects of government spending on infrastructure projects in order to stimulate economies should ensure that the period from 2023 to 2028 will exceed the current estimates and overall the growth rate of 3.48 % between 2018 and 2028 still looks to be valid. There will, of course, be variations between countries and regions which will mean that manufacturers will need to be quick on their feet to identify opportunities.

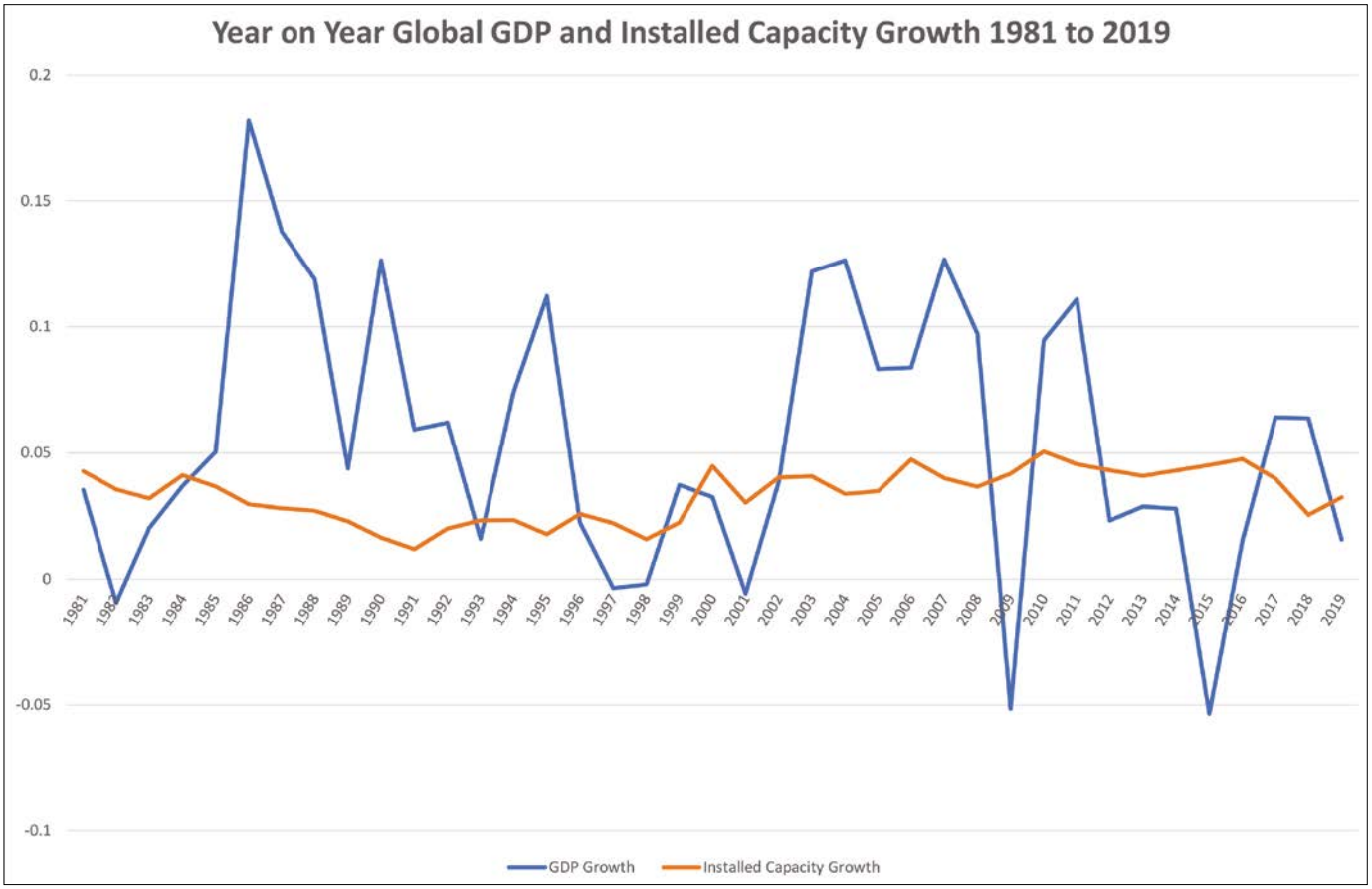

Figure 3. Global GDP & installed capacity growth rate long term comparison from 1981 to 2019

Transmission system transformers

The drivers impacting on the system transformer market are different from the GSU segment. As noted earlier, transmission network development is a mixture of capital expenditure (capex) and operational expenditure (opex). The critical difference between the two is that it is easier for utility companies to quickly cut back on opex than capex and in times of hardship that is what they do. This segment covers a broad range of transformers from the very largest auto-transformers measured in the 100's of MVA down to 10 or 20 MVA (depending on the definition used in each country). There is another factor unique to this segment of the transformer industry; it is also extremely sensitive to industrial investment.

This combination of drivers means that demand is likely to be suppressed, particularly in the more industrialised regions immediately following the pandemic, but it is equally likely to spring back in the medium term supported by infrastructure development. On this basis, it is estimated that the growth rate between

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Table 3. Transmission system transformer growth rates from 2019 to 2029

Transmission system transformer growth rates		
Region	**CAGR 2019 to 2024**	**CAGR 2024 to 2029**
Europe	1.12 %	1.48 %
FSU	1.62 %	2.36 %
Asia	4.10 %	5.15 %
S & C America	1.96 %	2.83 %
N America	0.94 %	1.87 %
ROW	2.07 %	2.77 %
World	**2.83 %**	**3.84 %**

It is estimated that the growth rate of the transmission system transformers market between 2019 and 2024 will be 2.83 % CAGR, and it will increase to 3.84 % between 2024 and 2029

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As a result of these suppressed growth rates this global market segment which was worth US$15.7 billion in 2019 will reach just over US$18 billion in 2024 and US$21.8 billion in 2029 (all values in 2019 US$).

Distribution transformers

Of the three, this segment is the most at risk from sudden economic shock. The supply of distribution transformers is principally a commodity business, and orders are often placed on a call-off basis from stock. The market is driven to a lesser extent by grid development in "new installations" or predominantly by maintenance and replacement of existing networks.

In the period post-Covid-19, the demand for distribution transformers is likely to be disproportionately depressed, for many reasons. Labour shortages, the need to reduce utility opex, depressed industrial demand, depressed consumer demand, de-stocking, reduced house building, lack of consumer mobility will all be negative drivers on this segment of the transformer market.

Table 4. Distribution transformer growth rates from 2019 to 2029

Distribution transformer growth rates		
Region	**CAGR 2019 to 2024**	**CAGR 2024 to 2029**
Europe	0.49 %	1.02 %
FSU	1.42 %	1.91 %
Asia	3.09 %	3.87 %
S & C America	1.82 %	1.91 %
N America	0.49 %	0.97 %
ROW	1.91 %	2.32 %
Total	**2.10 %**	**2.80 %**

Summary

Estimates for the transformer market that were produced at the start of 2020 – essentially pre-Covid-19 are shown in the table below compared with revised estimated as at Q4 2020.

The effects of the analysis shown in Table 5 result in a reduction of US$2.5 billion by 2024 and US$4.0 billion by 2029; this represents a reduction of 5 % and 6.5 % respectively.

The change in the overall composition of the market in terms of the type of transformer in 2019 and 2029 are as shown in Table 6 and Table 7.

Table 5. Global transformer market estimates pre- and post-Covid-19 from 2019 to 2029

Global transformer market estimates pre- and post-Covid-19 – Values US$ M					
	Base year	**Original estimate**	**Revised estimate**	**Original estimate**	**Revised estimate**
Region	2019	2024	2024	2029	2029
Europe	5,803.6	6,315.9	6,082.6	6,800.4	6,479.8
FSU	1,632.8	1,840.0	1,780.1	2,047.5	1,975.6
Asia	21,842.5	28,082.5	26,385.6	35,944.5	33,023.1
S & C America	1,911.0	2,170.0	2,116.9	2,472.7	2,390.2
N America	6,696.3	7,298.7	6,991.1	7,852.3	7,503.0
ROW	4,340.3	5,026.8	4,843.8	5,748.6	5,499.0
Total	**42,226.4**	**50,733.9**	**48,200.0**	**60,866.1**	**56,870.7**

Table 6. Global transformer market by type by region 2019

Global transformer market by type by region 2019				
	% Generator	% Transmission	% Distribution	Total
Europe	19.23 %	34.38 %	46.38 %	100.00 %
FSU	26.37 %	28.56 %	45.07 %	100.00 %
Asia	17.95 %	37.60 %	44.45 %	100.00 %
S & C America	25.74 %	38.48 %	35.78 %	100.00 %
N America	15.24 %	40.72 %	44.04 %	100.00 %
ROW	24.55 %	36.37 %	39.08 %	100.00 %
Total	**19.05 %**	**37.22 %**	**43.73 %**	**100.00 %**

Table 7. Global transformer market by type by region 2029

Global transformer market by type by region 2029				
	% Generator	% Transmission	% Distribution	Total
Europe	20.2 %	35.0 %	44.8 %	100.00 %
FSU	27.3 %	28.7 %	43.9 %	100.00 %
Asia	19.6 %	39.1 %	41.4 %	100.00 %
S & C America	26.6 %	39.0 %	34.4 %	100.00 %
N America	16.0 %	41.8 %	42.3 %	100.00 %
ROW	25.5 %	36.5 %	38.0 %	100.00 %
Total	**20.3 %**	**38.4 %**	**41.4 %**	**100.00 %**

Although the distribution transformer market is at most risk, the estimated growth rate of between 2019 and 2024 will be 2.10 % CAGR, with the increase to 2.80 % between 2024 and 2029

The changes do not look that dramatic but because the markets are so large in value terms even a small percentage change equates to millions of dollars reduction in the market and the message is particularly hard for the distribution transformer sector; however, at least the growth is measured in positive rather than negative percentages – albeit only just in some regions.

Author

Steve Aubertin is the Managing Director of Goulden Reports and following a first career in electrical engineering has spent the last 30 years researching and reporting on the global market for electrical products in both published and in the form of tailored research for specific clients.