

The Transforming R&D Industry

UNDERSTANDING THE TRAJECTORY OF GLOBALIZATION, INDUSTRIALIZATION AND CONSOLIDATION



Contents

GROWTH AND TRENDS	2
RISING EXPENDITURE	6
EVOLVING MARKET LANDSCAPE AND BUSINESS MODELS	8
ACQUISITION ACTIVITY	13
CONCLUSION	15



Growth and trends

The engineering and R&D services market is forecast to be worth EUR 195-200bn by 2022, growing on average 4.5-5%

As Fig. 1 shows, two further catalysts could accelerate this growth further, pushing the market's size to EUR 240bn: increases in the rate of externalization and outsourcing acceleration could altogether add a further EUR 40-45bn. These would boost market growth to 9% per year over 2017-2022, to be fuelled by four key trends:

- 1. the avalanche of te disruptions;
- 2. growth in High-Tec especially in the U
- 3. talent scarcity and mismatch betwee the demand of eng

FIG. 1: GLOBAL OUTSOURCED R&D AND ENGINEERING SERVICES MARKET (EURbn)



Source: Altran Technologies; OECD; IMF; IRI; International Management Consultants; Bryan, Garnier & Co

echnology	4. the industrial decision-makers'
	deliberate and contrasted approach
	to engineering and R&D sourcing.
ch industries	The highest annual growth
IS and in Asia;	potential, of 9-11%, is expected
	in Asia, with the US close behind
l geographic	at 8-10%. In Europe, engineering
n the supply and	and R&D services are forecast to
gineers;	grow at 4-6% per year, with France,
	a mature market for this sector,
	growing at 2-3% annually.





FIG. 2 R&D MARKET ADDRESSED BY OFFSHORE (2015-2020E) (EURbn)



Alongside this growth, we see six trends shaping the market:

1. GLOBALIZATION OF R&D AND ENGINEERING AT MAJOR INDUSTRIAL GROUPS

Schneider Electric has five R&D hubs around the world, Qualcomm has its global R&D centre in India, Nissan's R&D is based in Brazil, and Hyundai's European Technical Centre is based in Germany. Given that firms like these are adopting this globalized approach, it seems likely that industrial decision-makers will choose R&D partners based on their ability to operate at a global scale.

2. CONCENTRATION AMONG SERVICE PROVIDERS

Major industrial firms are also looking to cut costs and improve efficiency by streamlining the number of suppliers they use. This creates opportunities for larger global service providers, at the expense of smaller firms. Once, the engineering and R&D services industry was fragmented, with low barriers to entry, limited economies of scale, mostly local demand and weak client negotiating power.

Today, these characteristics are reversed, setting the sector up for further concentration. We have already seen this happen in France, whose automotive and aeronautics markets are among the most mature in the world. Major engineering consulting groups Altran, Alten and Akka have all seen robust market share growth in recent years. By 2022, we expect that 5-10 global players could serve around 20% of the market. Based on European Commission data1 we estimate that globally, about 2,500 companies account for 90% of R&D spend. Given that there are around 26,000 R&D and engineering services providers in Europe and 55,000 in the US, the potential for concentration is clear.

3. A NEW LEVEL OF MATURITY IN THE INDUSTRY

Outsourced R&D has changed a great deal in the past 30 years. It began in the 1980s, with engineers charged out on a time-and-materials basis for time spent with the client. During the 2000s, this evolved into teams working on specific projects at client sites. And from 2010 it scaled up to full outsourcing, with R&D groups handling entire product development cycles for their clients.

Today, a new co-innovation or 'design thinking' model is emerging. This sees R&D and engineering service providers working with clients as a partner in their approach to innovation. These providers have a global presence, skills that are transferable across industries, the ability to transform a client's R&D process and proprietary solutions that can be reused in other projects.

4. THE EMERGENCE OF A HYBRID MODEL

Some projects have led R&D service providers to develop proprietary solutions, from infrastructure and laboratories to their own methods and tools. Combining these solutions with R&D services creates a hybrid model that gives service providers more negotiating leverage while at the same time increasing clients' agility, efficiency and competitiveness.

5. GROWING INFLUENCE OF OFFSHORE

As Fig. 2 shows, the offshore R&D market could almost double by 2020. The main offshore destinations are India, Eastern Europe, the Iberian Peninsula, North Africa, China, South-East Asia and Mexico.



1. European Commission - The 2017 EU Industrial Investment Scoreboard. http://iri.jrc.ec.europa.eu/scoreboard17.html

According to the technology research and advisory firm ISG (Information Services Group), one-third of R&D and engineering activities are compatible with offshore, in particular design, encoding, prototyping, tests, validation and support, and this percentage could rise to 40-50% in coming years.

6. EVOLVING CLIENT DEMANDS

In the early days of outsourced R&D, clients handled product development and wanted service providers to simply execute for them: "do it for me". Then, clients looked for more help with development and manufacturing as they lacked all the necessary knowledge internally: "help me do it." Now, demand has extended upstream of the design phase to: "what should I do?"



Rising expenditure

As digital giants such as GAFA, Tesla and Uber invade their market, major industrial players are looking to step up the pace of their innovation.

Firms once classed as major R&D spenders have been displaced from the top 10 by the scale of the tech companies' investments. To avoid being left behind, industrials are looking to external partners for help.

The comparison between today and 20 years ago is striking. In the 1990s, only six companies spent more than USD 5bn per year on R&D, four of which were automotive or capital goods: General Motors, Ford, Daimler-Chrysler, Siemens, IBM and Lucent. In 2017, as Fig. 3 shows, over 20 companies invested USD 5bn+ on R&D, with 10 spending over USD 10bn.

Big tech companies account for seven of the top 10 spenders, pushing out all automotive firms apart from Volkswagen, now in third place after two years at #1. Nonetheless, three automakers - Daimler, General Motors and Honda – show steady increases in R&D spend, while expenditure at Volkswagen, Toyota and Ford is steady or slightly reduced. There are no engineering firms in the top 20 by R&D expenditure.

Overall R&D spend has risen steadily over the last three years, with year-on-year increases of 12% in 2016 and 11% in 2017.

FIG. 3: HIGHEST R&D SPENDING COMPANIES (USDbn)

USDbn	Industry	2015	
amazon.com	High-tech	12.5	
Alphabet Google	High-tech	12.3	· · · · · · · · · · · · · · · · · · ·
Volkswagen 🛞	Automotive	15.1	-
SAMSUNG ELECTRONICS	High-tech	12.1	· · · · · · · · · · · · · · · · · · ·
Microsoft	High-tech	11.9	
(intel)	High-tech	12.1	· · · ·
HUAWEI	High-tech	8.7	
Ć	High-tech	8.6	0 • • • • • • • • • • • • • • • • • • •
Johnson&Johnson	Life Sciences	9.0	· · · · ·
Roche	Life Sciences	9.7	
MERCK & CO., INC.	Life Sciences	6.7	· · · ·
DAIMLER	Automotive	7.3	· · · ·
TOYOTA MOTOR	Automotive	8.6	••••
U NOVARTIS	Life Sciences	8.7	
facebook	High-tech	4.8	
Pfizer	Life Sciences	7.7	• • •
<u>GM</u> GENERAL MOTORS	Automotive	6.0	
Ford Ford Motor Company	Automotive	6.7	*
HONDA The Power of Dreams	Automotive	3.8	••••
ORACLE	High-tech	5.6	· · · · · · · · · · · · · · · · · · ·
TOP 20		178.1	

2016	2017
16.1	22.6
13.9	16.6
15.1	14.7
12.2	14.5
12.3	13.9
12.7	13.1
10.4	12.5
10.5	12.1
9.1	10.6
10.1	10.2
10.1	10.0
8.4	9.8
9.6	9.4
8.4	8.3
5.9	7.8
7.9	7.7
6.6	7.3
7.3	7.3
6.1	6.7
6.0	6.2
198.8	221.3

Source: Companies' data; Bryan, Garnier & Co

Twenty years ago only six companies spent more than USD 5bn per year on R&D, four of which were automotive or engineering firms. Today, more than 20 companies spent over USD 5bn and 10 spent over USD 10bn.

Evolving market landscape and business models

From local to global.

BEGINNINGS

For more than 30 years, outsourced R&D developed in isolation. Each industrialized country had its own market specific to local labor laws, culture and industrial context. The common feature was that in each case, demand was driven by industrial decision-makers looking for flexibility. Different models emerged. In France, outsourcers first offered time-andmaterials services and then structured packages ranging from R&D consulting to industrial engineering. In Germany and northern Europe, engineering offices were first, followed by offers of integrated solutions in a specific industry, especially automotive. In Anglo-US countries and Benelux, the market was taken by temping agencies specialized in activities for engineers.

1990S-EARLY 2000S

The expansion of outsourced R&D beyond national borders began when multidisciplinary firms in France acquired smaller companies with similar models in southern Europe,

Benelux, the UK, Nordic countries and Germany. Players such as Altran and Alten primarily covered automotive, aeronautics, energy, telecoms and banking. In Germany, well- established local engineering firms such as Bertrandt, IAV and EDAG continued to dominate, some of them backed by major automakers. However, these firms had little or no international reach. In the US, there was no outsourced R&D market, because outsourcing was still handled by specialized temping agencies or contractors such as Belcan. This is still the case in most US manufacturing.

In the 2000s, following the finance sector's example, high-tech industries responded to the growth in software by outsourcing some development to Indian IT services companies once their tasks were standardized. This was the beginning of offshore product development services and saw the emergence of specialized players such as Aricent, Cyient, GlobalLogic, QuEST Global and Persistent Systems. At the same time, Indian IT services companies including HCL Technologies, TCS, Wipro, Infosys and KPIT created product engineering divisions.

MID 2000S-PRESENT

The scale of Indian players, by now generating USD 100 million + sales in outsourced product engineering, prompted market study firms to identify it as an industry in its own right. European groups identified the acquisition of Indian offshore specialist as a route into the US market. Alten bought Calsoft Labs in 2011, and Altran followed the purchase of Foliage in 2014 with the acquisitions of SiCon Tech, Lohika, Pricol Technologies, GlobalEdge and Aricent. Offshoring to India from the US primarily focuses on telecoms, software, electronics and semiconductors, with little focus on automotive, aeronautics, energy and health.

DISTINCT CATEGORIES

The competitive landscape has now evolved into six distinct categories of outsourced R&D and engineering companies, all of them adapted to local needs, yet also capable of addressing offshore. In our view, this is similar to the development of IT service providers in the early 2000s, when IBM, Accenture and Capgemini extended and strengthened their offers.



Fig. 4 shows how the market is evolving.

FIG. 4: COMPETITIVE BACKDROP IN OUTSOURCED R&D



Source: Altran Technologies; Bryan, Garnier & Co

There are six categories of competitors in R&D and engineering services. We have observed that it is the French multi-industry specialists are the best placed in the market to maximize the current R&D growth potential as they were the first to become truly international.

Six categories of R&D and engineering companies

1. FRENCH MULTI-INDUSTRY SPECIALIST

Companies such as Altran, Alten, Akka, Assystem Technologies, SII and Ausy have their origins in labour laws that were too rigid to allow them to fully manage their R&D projects internally. This is because the startup, ramp-up and deceleration phases of these projects require a certain degree of flexibility.

During the 2000s these players transformed from providing pure technical assistance (e.g. installation of engineers at a client site to work on specific project and billed on a time and materials basis) to work package offers, which meant engineers were supplied under a packaged offer and located nearby rather than at the client site to in order to reduce costs. This service method is now dominant in the French automotive and aeronautic sectors.

2. GERMAN VERTICAL SPECIALIST

Based on the vertical integration of engineering skills, the German model dates back to the 1960s and includes companies such as AVL, Bertrandt, EDAG, IAV and Ferchau. It is focused on the automotive sector and has been extended to the entire product development chain, from conception to production. This spans consulting, design, product engineering and processes, prototyping, modelling, vehicle tests and construction, mechanics, electricity, electronics and software. UK group Ricardo also operates to this model, which has been extended to other industries such as aeronautics and energy. Since 2014-15, German labor law reform has demanded that external service providers offered on a time-and-materials basis have the same conditions as client employees doing equivalent work. This has pushed up wages, prompting clients to favor other methods such as work packages.

3. INDIAN GENERALIST OFFSHORE

Product engineering services at Indian firms such as HCL, TCS, Wipro, L&T and Infosys are an extension of their IT services know-how. Their model encompasses entire batches of product development, testing and maintenance. These services are mostly related to customized software and the groups benefit from two advantages: experience in software development and offshore presence with a highly industrialized model. Main clients are telecoms, IT and semiconductor groups, especially in the US. Although a lack of expertise means Indian offshore firms have little presence in other industries, it is nonetheless increasing.

4. AMERICAN-INDIAN SPECIALIST OFFSHORE

Established in the 1990s, players such as Aricent, Cyient, QuEST, Persistent, GlobalLogic were built on activities transferred from the US. They stand out from Indian generalists for their high level of technical specialization and a genuine engineering culture. Here as well, their main clients are telecoms, IT and semiconductors, with a clear majority of US clients.

5. GLOBAL IT SPECIALISTS

This category includes Accenture, Capgemini and IBM. Accenture has significant clout in consulting, a recognized brand and an unrivaled network of offshore resources with around 330,000 employees working in its Global Delivery Network. Its outsourced R&D and engineering activities are located in several business units: Product Engineering & Lifecycle Services (PE&LS), Engineering & Product Operations (E&PO) and Accenture Interactive. Capgemini generates several hundred million euros of sales in outsourced R&D and product engineering via its product and engineering services division, which employs 10,000 engineers including 4,000 at Sogeti High Tech. IBM has a Product **Testing & Engineering Design Services** business (PTEDS) which covers several entities specialized in design, development, testing and analysis.

6. EASTERN EUROPEAN SOFTWARE ENGINEERING

IT service providers EPAM, Luxoft and SoftServe, established in the 1990s in Belarus, Russia and Ukraine respectively, specialize in software engineering. Luxoft and EPAM are NYSE-listed. EPAM is the biggest software engineering player in Eastern Europe with more than 23,700 engineers, designers and consultants (including 7,500 in Belarus, 4,900 in Ukraine, 3,900 in Russia, 3,100 in central Europe and 1,800 in Asia Pacific). Luxoft is the second-largest, with 13,100 employees including over 11,100 engineers (including 3,500 in Ukraine, 2,050 in Poland, 2,000 in Russia and 1,850 in Romania).



THE INDUSTRY **RANKED BY SALES**

Fig. 5 lists R&D and engineering services players by 2017 sales in USD. For certain listed players (TCS, Tata Technologies) and non-listed firms (AVL, IAV, Belcan, Ferchau, Aricent, QuEST Global, Ausy, GlobalLogic), we have used estimates

based on public-domain information. We have deliberately omitted certain groups, for example Accenture, Capgemini, Tech Mahindra, Mindtree, Cognizant and Luxoft as we do not have precise information on their sales in this field. However, we estimate that Accenture and Capgemini generate around USD 1bn and USD 500 million respectively in these fields.

FIG. 5: 2017 SALES OF MAIN OUTSOURCED R&D AND ENGINEERING COMPANIES (USDm)



Source: Company data: Bryan, Garnier & Co

Acquisition activity

This widening of skills and geographical presence in R&D and engineering services is primarily being achieved through acquisition.

Acquistion activity has been largely dominated by Altran followed by HCL Technologies and Akka.

Fig. 6 illustrates the acquisitions of companies with at least 500 R&D and engineering staff over the last 10 years. Altran's acquisition of Aricent for EUR1.7bn was the largest.

Private equity funds have also made sizeable deals. Ardian acquired 60% of Assystem's Global Product Services (GPS) division by for EUR550m in November 2017, and Apax bought GlobalLogic USD 420m in 2014. NB. Apax sold half of its 96% stake in GlobalLogic to CPPIB (Canada Pension Plan Investment Board) in 2017 for an enterprise value of USD 1.5bn, and got rid of the other half to Partners Group in 2018 for an enterprise value of USD 2bn.

IT services providers have made no major acquisitions in the past 10 years. Their outsourced R&D and product engineering businesses have developed as follows:



Accenture acquired design studio Fjord, which employs 160 people, in 2013, adding it to Accenture Interactive, its network of design agencies. As of today, Accenture's global network of 27 design studios

employs more than 1,000 staff. Product engineering firm Altitude was acquired in January 2017. At the same time, Accenture built a business associated with Industry 4.0 (e.g. digital manufacturing, IOT), combining consulting, development, integration and operations.

Capgemini

Capgemini inherited an outsourced R&D business with its acquisition of Transiciel in 2003. This business was integrated into Sogeti as Sogeti High Tech and employs more than 4,000 people in 27 locations in Europe, India and Russia. We estimate that Sogeti High Tech has around EUR 300m in sales. In addition, with its acquisition of Igate in 2015, Capgemini inherited a product engineering business primarily based in India, now combined with Sogeti High Tech integrated into Capgemini's Technology & Engineering Services division (15% of group sales). Over the past two years, the group has deployed Industry 4.0 offers associated with PLM, digital operations and connected objects.

TEM

IBM has made no acquisitions in this field but has developed offers associated with outsourced R&D and product engineering. More recently, these offers have been integrated into the Watson AI programme.

Date	Acquirer	Target	Country	Price	Head- count	Sales	Op. margin	Multiples
03/2018	altran	Aricent	USA	EU- R1721m	10 500	EUR624m (2017)	18.7% (2017)	2.8x 2017 rev. 15x 2017 EBIT
11/2017	ARDIAN	assystem GPS division	France	EUR550m	8 500	EUR578m (2016)	8.1% (2016)	1x 2016 rev. 12x 2016 EBIT
09/2017	altran	GLOBAL EDGE	India	N/A	1 000	EUR21m (2017)	20% (2017)	N/A
03/2017	АКЖА		Germany	N/A	1 000	EUR119m (2016)	7% (2016)	N/A
03/2017	HCL	Geometric	India	INR13,000 (USD200m)	2 600	INR12m (2015/2016)	11.7% (2015/2016)	1.1x 2016 rev. 9x 2016 EBIT
02/2017	altran	× pricol	India	EUR31m	520	EUR12m (2016)	N/A	0.4x 2016 rev.
01/2017	HCL		USA	USD85m	900	USD85m (2015)	12.2% (2015)	1x 2015 rev. 8x 2015 EBIT
01/2017	altran		Germany	N/A	700	EUR62m (2016)	N/A	N/A
08/2016	altran	🛃 lohika	USA	N/A	700	EUR36m (2015)	14% (2015)	N/A
03/2016	ALTEN	ASM Technologies Limited	India	N/A	720	EUR16m (2015)	8% (2015)	N/A
01/2016	Global Logic °	rec Global	Poland	N/A	500	N/A	N/A	N/A
09/2015	altran	SiConTech	India	N/A	526	EUR13m (2015)	N/A	N/A
08/2015	Aricent	SMARTPLAY	India	USD180m	1 200	N/A	N/A	N/A
03/2015	altran	NSPYRE	NL	N/A	629	EUR64m (2014)	N/A	N/A
02/2014	altran	Foliage	USA	USD128m	500	EUR37m (2013)	18% (2013)	2.5x 2013 rev. 14x 2013 EBIT
03/2014	ALTEN	Future in motion	France	EUR7m	650	EUR31m (2014)	losses	0.2x 2013 rev.
01/2014	Apax PARTNERS	Global Logic °	USA	USD420m	6 600	USD400m (2013)	20% (2013)	1.1x 2013 rev. 18x 2013 EBIT
02/2013	altran		Germany	EUR105m	1 800	EUR161m (2012)	10% (2012)	0.7x 2012 rev. 7x 2012 EBIT
01/2013	λτον Ξεdag		Germany	EUR50m	650	EUR50m (2012)	N/A	1.0x 2012 rev.
09/2012	λτον Ξεdag	RÚCKER	Germany	EUR120m	2 600	EUR189m (2012)	4.8% (2012)	0.6x 2012 rev. 13x 2012 EBIT
04/2012	АКЖА	MB tech (65%)	Germany	N/A	3 000	EUR350m (2011)	N/A	N/A
09/2011	АКЖА	aeroconseil	France	N/A	1 235	EUR105m (2010)	7% (2010)	N/A
05/2011	Global Logic °	Rofous	USA	N/A	1 500	N/A	N/A	N/A
04/2011	ALTEN	calsoft	USA	EUR15m	600	USD22m (2010)	9% (2010)	0.9x 2010 rev. 6x 2010 EBIT
12/2008	ALTEN	XDINS	Sweden	EUR18m	550	EUR41m (2007)	8.4% (2007)	0.4x 2008 rev.





White Paper Author



Gregory Ramirez Equity Research Analyst Software & IT Services gramirez@bryangarnier.com

Technology Team

INVESTMENT BANKING

Partner,

PARIS



Greg Revenu Managing Partner grevenu@bryangarnier.com



Application Software & IT Services tdesmedt@bryangarnier.com

Thibaut De Smedt

MUNICH



Falk Müller-Veerse fmuellerveerse@bryangarnier.com

EQUITY RESEARCH ANALYST TEAM



Richard-Maxime Beaudoux Video Games, Payment & Security rmbeaudoux@bryangarnier.com



Thomas Coudry Telecoms & Media tcoudry@bryangarnier.com

EQUITY CAPITAL MARKETS



Pierre Kiecolt-Wahl Managing Director pkiecoltwahl@bryangarnier.com

EQUITY DISTRIBUTION







Nicolas d'Halluin Partner, Head of US Distribution ndhalluin@bryangarnier.com

Olivier Beaudouin Partner, Technology & Smart Industries obeaudouin@bryangarnier.com

Philippe Patricot Managing Director, Technology ppatricot@bryangarnier.com



Gregory Ramirez

Software & IT Services

gramirez@bryangarnier.com

Xavier Caroen Automotive Technologies xcaroen@bryangarnier.com

Pierre-Antoine Chazal Smart Energy pachazal@bryangarnier.com

Fréderic Yoboué Semiconductors fyoboue@bryangarnier.com





Corporate Transactions

Bryan, Garnier & Co leverage in-depth sector expertise to create fruitful and long lasting relationships between investors and European growth companies.



About Bryan, Garnier & Co

Bryan, Garnier & Co is a European, full service growth-focused independent investment banking partnership founded in 1996. The firm provides equity research, sales and trading, private and public capital raising as well as M&A services to growth companies and their investors. It focuses on key growth sectors of the economy including Technology, Healthcare, Consumer and Business Services. Bryan, Garnier & Co is a fully registered broker dealer authorized and regulated by the FCA in Europe and the FINRA in the U.S. Bryan, Garnier & Co is headquartered in London, with additional offices in Paris, Munich, Zurich and New York. The firm is a member of the London Stock Exchange and Euronext.

Bryan, Garnier & Co Technology Equity Research Coverage



6 Analysts | 50+ Stocks Covered

With more than 150 professionals based in London, Paris, Munich, Zurich and New York, Bryan, Garnier & Co combines the services and expertise of a top-tier investment bank with a long-term client focus.





LONDON	PARIS	MUNICH	ZURICH	NEW YORK
Beaufort House	26 Avenue des Champs	Widenmayerstrasse 29	Theaterstrasse 4	750 Lexington Avenue
15 St. Botolph Street	Elysées	80538 Munich	8001 Zurich	New York, NY 10022
London, EC3A 7BB	75008 Paris	Germany	Switzerland	USA
UK	France			
T: +44 (0) 20 7332 2500	T: +33 (0) 1 56 68 75 00	T: +49 89 242 262 11	T: +41 44 991 3300	T: +1 (0) 212 337 7000
F: +44 (0) 20 7332 2559	F: +33 (0) 1 56 68 75 01	F: +49 89 242 262 51		F: +1 (0) 212 337 7002
Authorized and regulated	Regulated by the Financial			FINRA and SIPC member
by the Financial Conduct	Conduct Authority (FCA)			
Authority (FCA)	and the Autorité de Contrôle			
	prudential et de resolution			
	(AUFN)			

IMPORTANT INFORMATION

This document is classified under the FCA Handbook as being investment research (independent research). Bryan Garnier & Co Limited has in place the measures and arrangements required for investment research as set out in the FCA's Conduct of Business Sourcebook.

This report is prepared by Bryan Garnier & Co Limited, registered in England Number 03034095 and its MIFID branch registered in France Number 452 605 512. Bryan Garnier & Co Limited is authorised and regulated by the Financial Conduct Authority (Firm Reference Number 178733) and is a member of the London Stock Exchange. Registered address: Beaufort House 15 St. Botolph Street, London EC3A 7BB, United Kingdom.

This Report is provided for information purposes only and does not constitute an offer, or a solicitation of an offer, to buy or sell relevant securities, including securities mentioned in this Report and options, warrants or rights to or interests in any such securities. This Report is for general circulation to clients of the Firm and as such is not, and should not be construed as, investment advice or a personal recommendation. No account is taken of the investment objectives, financial situation or particular needs of any person.

The information and opinions contained in this Report have been compiled from and are based upon generally available information which the Firm believes to be reliable but the accuracy of which cannot be guaranteed. All components and estimates given are statements of the Firm, or an associated company's, opinion only and no express representation or warranty is given or should be implied from such statements. All opinions expressed in this Report are subject to change without notice. To the fullest extent permitted by law neither the Firm nor any associated company accept any liability whatsoever for any direct or consequential loss arising from the use of this Report. Information may be available to the Firm and/or associated companies which are not reflected in this Report. The Firm or an associated company may have a consulting relationship with a company which is the subject of this Report.

This Report may not be reproduced, distributed or published by you for any purpose except with the Firm's prior written permission. The Firm reserves all rights in relation to this Report.

Past performance information contained in this Report is not an indication of future performance. The information in this report has not been audited or verified by an independent party and should not be seen as an indication of returns which might be received by investors. Similarly, where projections, forecasts, targeted or illustrative returns or related statements or expressions of opinion are given ("Forward Looking Information") they should not be regarded as a guarantee, prediction or definitive statement of fact or probability. Actual events and circumstances are difficult or impossible to predict and will differ from assumptions. A number of factors, in addition to the risk factors stated in this Report, could cause actual results to differ materially from those in any Forward Looking Information.

Disclosures specific to clients in the United Kingdom This Report has not been approved by Bryan Garnier & Co Limited for the purposes of section 21 of the Financial Services and Markets Act 2000 because it is being distributed in the United Kingdom only to persons who have been classified by Bryan Garnier & Co Limited as professional clients or eligible counterparties. Any recipient who is not such a person should return the Report to Bryan Garnier & Co Limited immediately and should not rely on it for any purposes whatsoever.

NOTICE TO US INVESTORS

This research report (the "Report") was prepared by Bryan Garnier & Co Limited for information purposes only. The Report is intended for distribution in the United States to "Major US Institutional Investors" as defined in SEC Rule 15a-6 and may not be furnished to any other person in the United States. Each Major US Institutional Investor which receives a copy of this Report by its acceptance hereof represents and agrees that it shall not distribute or provide this Report to any other person. Any US person that desires to effect transactions in any security discussed in this Report should call or write to our US affiliated broker, Bryan Garnier Securities, LLC. 750 Lexington Avenue, New York NY 10022. Telephone: 1-212-337-7000.

This Report is based on information obtained from sources that Bryan Garnier & Co Limited believes to be reliable and, to the best of its knowledge, contains no misleading, untrue or false statements but which it has not independently verified. Neither Bryan Garnier & Co Limited and/or Bryan Garnier Securities LLC make no guarantee, representation or warranty as to its accuracy or completeness. Expressions of opinion herein are subject to change without notice. This Report is not an offer to buy or sell any security.

Bryan Garnier Securities, LLC and/or its affiliate, Bryan Garnier & Co Limited may own more than 1% of the securities of the company(ies) which is (are) the subject matter of this Report, may act as a market maker in the securities of the company(ies) discussed herein, may manage or co-manage a public offering of securities for the subject company(ies), may sell such securities to or buy them from customers on a principal basis and may also perform or seek to perform investment banking services for the company(ies).

Bryan Garnier Securities, LLC and/or Bryan Garnier & Co Limited are unaware of any actual, material conflict of interest of the research analyst who prepared this Report and are also not aware that the research analyst knew or had reason to know of any actual, material conflict of interest at the time this Report is distributed or made available.