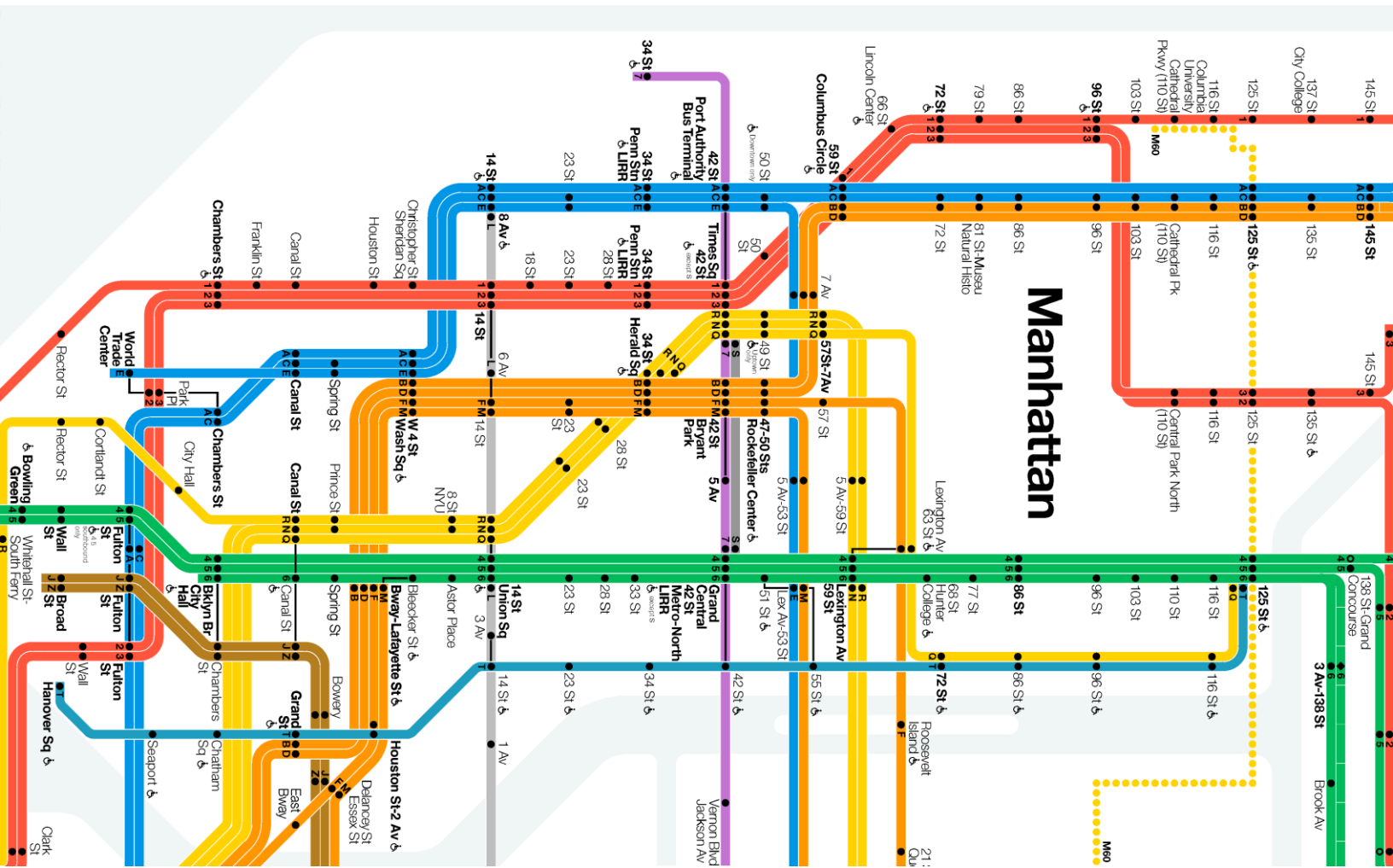


Research Roadmap 2017

*Including:
Proprietary Model Dictionary
and Library Exhibit Bibliography*



About

Alphacution Research Conservatory

Alphacution Research Conservatory is the first digitally-oriented research and strategic advisory business model focused on providing data, analytics and technical infrastructure intelligence to all institutional participants in the financial services ecosystem. Founded by Paul Rowady, Alphacution is specifically designed with a dual mission: 1) Deliver uncommon and data-driven intelligence for data, analytics and technology narratives related to the financial services industry (FSI), and 2) Leverage digital-era tools, technologies and methods in the development and delivery of its products and services, as well as to exemplify the cultural and organization dynamics that are integral to such an effort. Alphacution's core research and advisory services are based on its composite modeling for enterprise and business segment total cost of ownership (TCO) and other FSI technology market sizing, including its trademarked T-Greeks™ Operational Analytics Framework for TCO benchmarking. More information can found at www.alphacution.com. Please send inquiries to info@alphacution.com and follow on Twitter: @alphacution.

E. Paul Rowady, Jr.

Paul Rowady is the Founder and Director of Research for Alphacution Research Conservatory, the first digitally-oriented research and strategic advisory business model focused on providing data, analytics and technical infrastructure intelligence within the financial services industry. Most recently the founding principal of TABB Group's technology, analytics and data advisory practice, Paul is in his 28th year of senior-level research, technology, capital markets and proprietary trading roles with firms like O'Connor & Associates, Quantlab, Ritchie Capital Management and TABB Group; and has depth of background in trading strategy research, risk analytics systems and technology development. He also has specific expertise in derivatives, highly automated trading systems, and numerous data management initiatives. Paul is a featured speaker at global markets, technology, data, analytics, and visualization events; regularly quoted in national, financial and industry media; and has provided live and recorded commentary for national and client media channels. Paul's most recent research and consulting focus has related primarily to digital transformation, technology spending / total cost of ownership (TCO) benchmarking, big data analytics, high performance computing (HPC) technologies, OTC derivatives reforms and quantitative trading methods. He earned a Master of Management from the J. L. Kellogg Graduate School of Management at Northwestern University and a B.S. in Business Administration from Valparaiso University. He was also awarded a patent related to data visualization and information design for trading and research systems in 2008.

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Research Roadmap

The follow represents a brief description and modeling constituents for upcoming Alphacution research output in 2017 and beyond:

1st Annual IT Services Study (20 providers)

Modeling and FIRST annual study on numerous operational and pricing trends, market sizing and additional analysis for the **IT Services sector** as it relates to the banking and financial services ecosystem over the period from FYE 2005 through FYE 2015 / 2016 (wherever application).

Additional modeling, analysis and output to compare and contrast Indian providers relative to those based in the US and Europe. Modeling to be based on the following list of individual providers:

Exhibit 1: Current Models for **2017 IT Services Study (20 providers)**

Entity	Hdqrtrs	Currency
Accenture	Ireland	USD
Atos Origin	France	EUR
CapGemini	France	EUR
CGI Group	Canada	CAD
Cognizant	United States	USD
Computer Sciences Corp. (CSC)	United States	USD
Exlservice Holdings	United States	USD
Firstsource Solutions	India	INR
Genpact	Bermuda	USD
HCL Technologies	India	INR
Hexaware	India	INR
Infosys	India	INR
Luxoft Holding, Inc.	Switzerland	USD
MindTree	India	INR
Mphasis	India	INR
Tata Consultancy Services (TCS)	India	INR
Tech Mahindra	India	INR
Unisys	United States	USD
Wipro	India	INR
WNS Global Solutions	India	INR

Source: Alphacution

2nd Annual Global Bank Technology Spending Study (~75 banks)

Modeling – including FY2016 updates to existing models plus up to an additional 15-25 new models - and the SECOND annual study on technology spending, T-Greeks™ benchmarks, market sizing and additional analysis for the **Global Bank sector**, most models for which currently comprise the timeline from the initial global banking study of FYE 2005 through FYE 2015. Additional output expected to focus on regional, scale, functional, and/or other segmentations from this dataset, such as 1) focused analysis of Japanese, Chinese or Canadian banks; 2) focused analysis of Top 10 Investment Banks; and/or, 3) the development of quarterly benchmarks for a subset of the most notable ecosystem players, like JP Morgan, Barclays or Deutsche Bank, for instance. Further development of the “assets per employee” benchmarking exercise – which has already been useful in showcasing the nature of core strategies - will be included in this study, as well. The next phase of global bank sector modeling to be based on the following expanded list of (up to 79) companies:

Exhibit 2: Current Models for 2017 Global Bank Technology Spending Study (58):

Banking Group	Banking Group (cont.)	Banking Group (cont.)
ABN Amro Group NV	Commonwealth Bank of Australia	Mitsubishi UFJ Financial Group Inc.
Agricultural Bank of China, Ltd.	Credit Agricole Group	Mizuho Financial Group Inc.
Australia and New Zealand Banking Group, Ltd.	Credit Suisse Group AG	Morgan Stanley
Banco Bilbao Vizcaya Argentaria SA (BBVA)	Daiwa Securities Group Inc.	National Australia Bank, Ltd.
Banco do Brasil SA	Danske Bank A/S	Nomura Holdings Inc
Banco Santander SA	Deutsche Bank AG	Nordea Bank AB
Bank of America Corp	Development Bank of Singapore	Northern Trust
Bank of China, Ltd.	Fifth Third	PNC Financial Services Group Inc.
Bank of Montreal	Goldman Sachs Group, Inc.	Rabobank Group
Bank of New York Mellon Corp.	Groupe BPCE	Royal Bank of Canada
Bank of Nova Scotia	HSBC Holdings Plc	Royal Bank of Scotland Group Plc
Barclays Plc	Industrial and Commercial Bank of China, Ltd.	Société Générale
BGC Partners	ING Bank NV	Standard Chartered Plc
BNP Paribas SA	Intesa Sanpaolo SpA	State Street
Canadian Imperial Bank of Commerce	Itau Unibanco Holding SA	Sumitomo Mitsui Financial Group Inc.
China Construction Bank Corp.	Jefferies LLC	Toronto-Dominion Bank
Citigroup, Inc.	JP Morgan Chase & Co.	UBS AG
Comerica	Key Bank	Unicredit Group SpA
Commerzbank AG	Lloyds Banking Group Plc	US Bancorp
		Wells Fargo & Co.

Source: Alphacution

Exhibit 3: New Models for 2017 Global Bank Technology Spending Study (up to 21)

Entity	Country	Currency
Allied Irish Bank / AIB Group (UK) PLC	Ireland	GBP
Banco Bradesco	Brazil	BRL
Bank of Communications	China	CNY
Bayerische Landesbank / BayernLB	Germany	EUR
BB&T	US	USD
BOC Hong Kong	Hong Kong	HKD
Capital One Financial	US	USD
Charles Schwab	US	USD
China Development Bank	China	CNY
China Merchants Bank	China	CNY
Erste Group Bank AG	Austria	EUR
HDFC Bank	India	INR
KBC	Belgium	EUR
KfW	Germany	EUR
Macquarie Group	Australia	AUD
National Bank of Canada	Canada	CAD
Postal Savings Bank of China (PSBC)	China	CNY
Prudential Financial	US	USD
Sberbank	Russia	RUB
SunTrust	US	USD
Westpac Banking Corp	Australia	AUD

Source: Alphacution

1st Annual Global Exchange Technology Spending Study (25 exchanges)

This is the FIRST annual study based on new modeling related to technology spending trends, T-Greeks analytics, and other key market trends for the **Global Exchanges sector** over the timeline from FYE 2005 through FYE 2016, wherever possible.

Furthermore, this study will be unique in that it will also update existing modeling related to *real-time, consolidated, and other market data trends* as well as the latest evidence of spending patterns on outsourced market data infrastructure by cross-compositing the exchange models with those of leading market data-related solution providers, such as Thomson Reuters, McGraw-Hill Financial (S&P Global), IHS Markit, and FactSet Research Systems, as well as potentially other leading FSI players, like FIS.

Modeling for this study to showcase the following list of (25) exchanges:

Exhibit 4: New Models for 2017 Global Exchange Technology Spending Study (25 exchanges)

Exchange Group	Code	Hdqtrts	Currency
Australian Securities Exchange	ASX	Australia	AUD
BATS Global Markets	BATS	US	USD
BM&FBOVESPA S.A.	BSX	Brazil	BRL
BME Spanish Exchanges	BME	Spain	EUR
BSE India Limited	BSE	India	INR
Bursa Malaysia	MYX	Malaysia	MYR
CBOE Holdings, Inc.	CBOE	US	USD
CME Group	CME	US	USD
Deutsche Börse AG	DB1	Germany	EUR
Euronext NV		Netherlands	EUR
Hong Kong Exchanges and Clearing	HKX	Hong Kong	HKD
Intercontinental Exchange, Inc. / NYSE	ICE	US	USD
Japan Exchange Group, Inc.	JPX	Japan	JPY
Johannesburg Stock Exchange	JSE	S Africa	ZAR
Korea Exchange	KRX	S Korea	KRW
London Stock Exchange Group	LSE	UK	GBP
Moscow Exchange	MOEX	Russia	RUB
Nasdaq	NASD	US	USD
National Stock Exchange of India Limited	NSE	India	INR
Singapore Exchange	SGX	Singapore	SGD
SIX Swiss Exchange	SIX	Switzerland	CHF
Taiwan Futures Exchange	TAIFEX	Taiwan	TWD
Taiwan Stock Exchange	TWSE	Taiwan	TWD
TMX Group Inc.	TMX	Canada	CAD

Source: Alphacution

1st Annual Asset Manager Technology Spending Study (~50 managers)

New modeling and FIRST annual study on technology spending, T-Greeks analytics, key market trends, and other observations for the **Asset Management sector** – which will include a diverse selection of *traditional and alternative asset managers and advisory firms* - for the period beginning FY 2015 through FY2016, wherever possible.

In addition to our customary modeling and exploration of technology spending trends, technical leverage and other productivity measures, we will be diving much more deeply into the development of our “AuM per employee” analytics for this study given our hypothesis that this metric is highly correlated to the underlying core trading or investment strategy – and, the hypothesis that it could help us pierce the current data opacity of “AuX” businesses within larger financial services conglomerates.

Modeling to showcase the following list of (up to 50) asset managers / advisors:

Exhibit 5: New models for **2017 Asset Manager Technology Spending Study (~50 managers)**

Asset Management / Advisory	Asset Management / Advisory (cont.)
Aberdeen Asset Management	Lazard Asset Management
Aegon NV	Legal & General Investment Management
Affiliated Managers Group (AMG)	Legg Mason
AllianceBernstein	Leucadia National Corp.
Allianz Global Investors	Lincoln Financial Network
Ameriprise Financial Inc. (AMP)	LPL Financial
Amundi	Man Group plc
Apollo Global Management, LLC	Mass Mutual
Aviva Investors	Nataxis
AXA Equitable	Neuberger Berman
Berkshire Hathaway, Inc.	New York Life
Blackrock	NFP Advisor Services
Blackstone Group, LP	Northwestern Mutual
Brookfield Asset Management, Inc.	Och-Ziff Capital Management, LLC
Calamos Asset Management, Inc.	Omega Healthcare Investors, Inc.
Carlyle Group, LP	Oppenheimer
Castle Alternative Invest AG	Raymond James Financial Inc. (RJF)
DekaBank	Schroder Investment Management
Eaton Vance Management (International)	Securian Financial
Federated Investors	SEI Investments Company
Fortress Investment Group, LLC	Standard Life Investments
Franklin Templeton	T. Rowe Price
Generali Investments Europe	Tetragon Financial Group, Ltd.
Invesco	Voya Financial Inc. (VOYA)
Janus Capital Group	Waddell & Reed Financial Inc. (WDR)

Source: Alphacution

Enterprise Solutions and "Big FinTech" Studies (50 vendors combined)

Additional future studies focusing on key trends, market sizing and additional analysis will include, but are not limited to, the addition of **Enterprise IT Solutions** and **"Big FinTech"** sectors. Like the impact from the upcoming (Q1-17) study on the IT Services sector, we expect additional "bottom-up" intelligence earned from modeling additional solution seller segments to highly complement the "top-down" intelligence earned from modeling FSI solution buyer segments, like banks and asset managers.

In other words, modeling solution buyers tends to help define the value of the total ecosystem spending "pie" without shedding much light on the value of the components of that pie (beyond the most coarse taxonomy of hardware, software, and IT human capital – which of course is still quite valuable). As we model the various sectors of solution sellers, we expect to discover details and develop insights related to the next layer or two of granularity, such as spending patterns related to market data infrastructure, back-office vs. front-office solutions, or governance, risk and compliance (GRC) solutions, for instance.

The companies to be showcased in these studies currently include ~20 Enterprise IT firms and ~30 "Big FinTech" firms, listed as follows:

Exhibit 6: Current / New Models for Upcoming Enterprise IT Solutions and Big FinTech Studies

Enterprise IT	"Big FinTech" (cont.)
Cisco	D+H Corporation
EMC	Diebold
EPAM Systems	Equifax
Fujitsu	Factset Research Systems
Hewlett Packard Enterprise (HPE)	First Data
Hitachi	First Data Corp
HP Inc.	FIS
IBM	Fiserv
Intel	Interactive Data
Lenovo	Jack Henry Associates
Microsoft	Markit
NTT Data	McGraw Hill Financial (S&P Global)
OpenText	Moody's Analytics / Moody's Corp
Oracle	Morningstar
SAP	NCR
TeleTech	Nomura Research Institute
Teradata	Progress Software
Verint Systems	SIX
VMWare	Software AG
Xerox	SS&C Technologies
	SunGard (pre-FIS)
"Big FinTech"	Thomson Reuters
ACI Worldwide	TIBCO
Broadridge	Total Systems Services
CA Technologies	Wincor Nixdorf
Corelogic	

Source: Alphacution

Note: The modeling components, timing and chronology of the studies outlined above are contingent upon ongoing client, stakeholder and other business needs, and therefore, subject to periodic modification.

Research Mission

Alphacution is developing a composite model that will ultimately represent a detailed, 360° view of technology spending patterns, “technical leverage”, and the “return on technology” for various segments and perspectives in the global financial services ecosystem. We have come to understand these efforts collectively as *technology economics*, (or, in this case, *fintech economics*). The motivation behind this mission is to be able to provide the most impactful, data-driven *navigational intelligence* to our clients for the primary engines of their ongoing transformations, which include the interplay between technology and human capital. Already, this modeling provides an unexpected wealth of intelligence about *operational efficiency* and *business transformation* for the global financial sector. Context is the cause of this, which means there is far more value in the journey - for us and you - than the destination...

Methodology

For the current phase of development, we meticulously harvest financial and operational data from publicly-available sources, such as company annual reports and regulatory filings¹. This dataset includes primarily annual data from all companies in our model library and also selective quarterly data samples from a subset of the same companies. Specifically, most data points are harvested from the income statements, balance sheets, and detailed notes for each of these reports.

Our initial focus has been mainly on the technology spending patterns of the largest global banks (given that they are typically the largest absolute buyers of technology in the FSI ecosystem), but continues to expand into other firm types, including brokers, asset managers, pension funds, exchanges, post-trade utilities, technology vendors, IT service providers, and others inside of and tangential to the financial services arena that add value and context to this ongoing analysis.

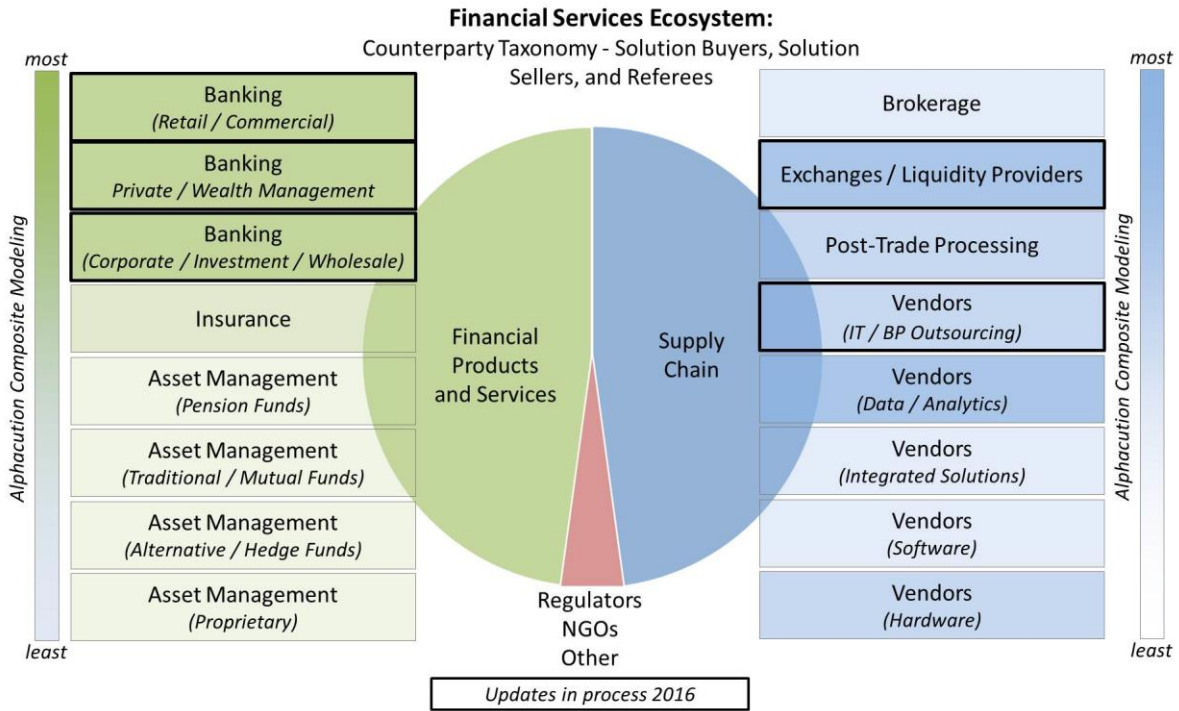
As of the development of this content, the core composite model currently includes *individual models* – including financial and operational data - from 118 banks, brokers, asset managers, technology vendors, exchanges, and others - most of which over the entire 11-year period ending December 31, 2015². Many of these – and new modeling – are in the process of updates with 2016 data. By the end of this phase of development at the end of 2017 or early 2018, we expect the Alphacution model library to contain more than 200 detailed and robust models based on key players in the global financial services ecosystem. Furthermore, this modeling is incredibly diverse, with the companies in the latest version of the composite model being headquartered in at least 24 countries and who report their financials in 19 currencies; all analytics from which have been converted and normalized to US dollars.

The following exhibits represent a series of simple taxonomies that illustrate the various perspectives for how Alphacution sees various FSI players fitting together:

¹ Includes, for example, US SEC’s Forms 10-K, 10-Q, and 20-F (which must be submitted by all “foreign private issuers” that have listed equity shares on exchanges in the United States).

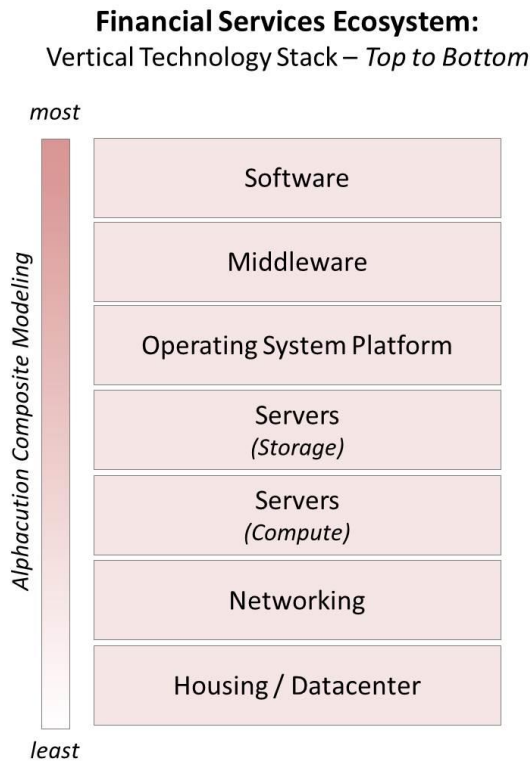
² Subscribers to Alphacution’s Premium Content Library receive access to detailed output from individual and composite models.

Exhibit 7: Counterparty Taxonomy: Solutions Buyers, Solution Sellers and Referees



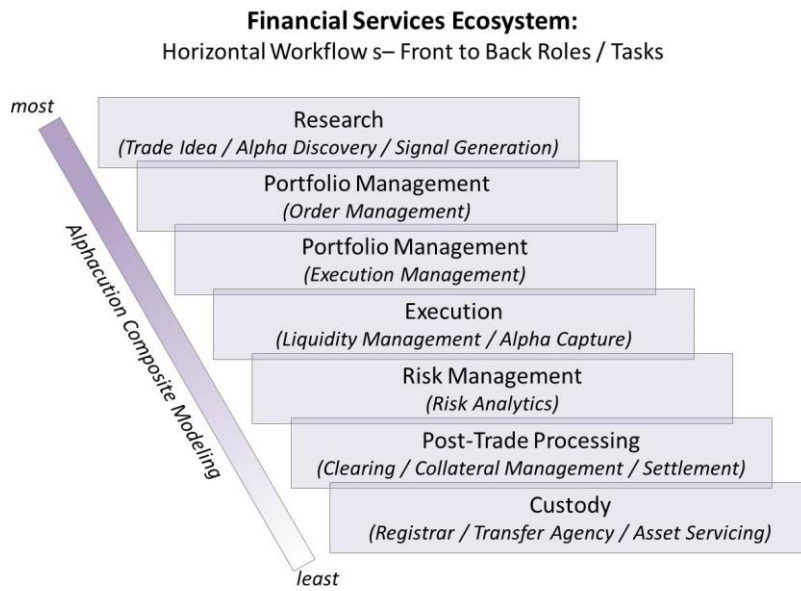
Source: Alphacution

Exhibit 8: Technology Stack Taxonomy: Top to Bottom



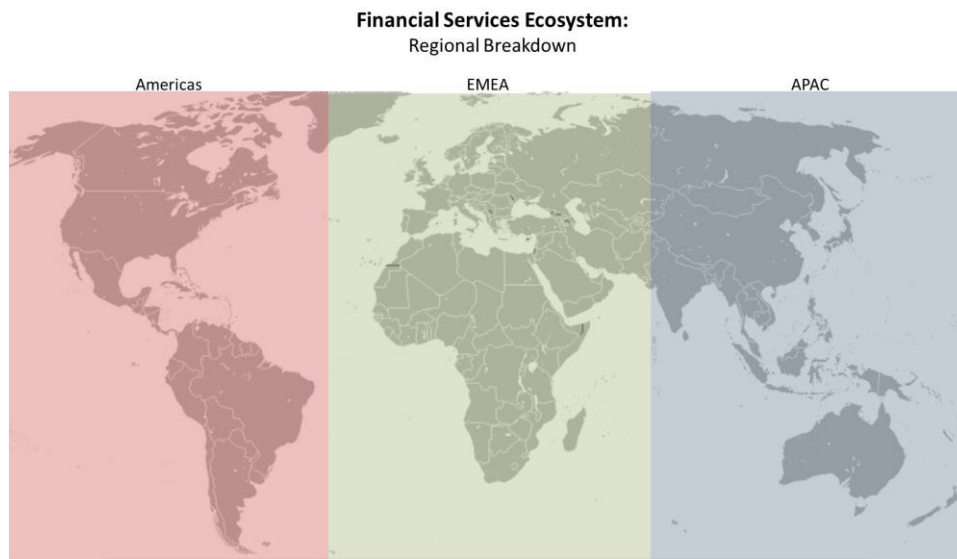
Source: Alphacution

Exhibit 9: Horizontal Workflow Taxonomy: Front to Back Roles / Tasks



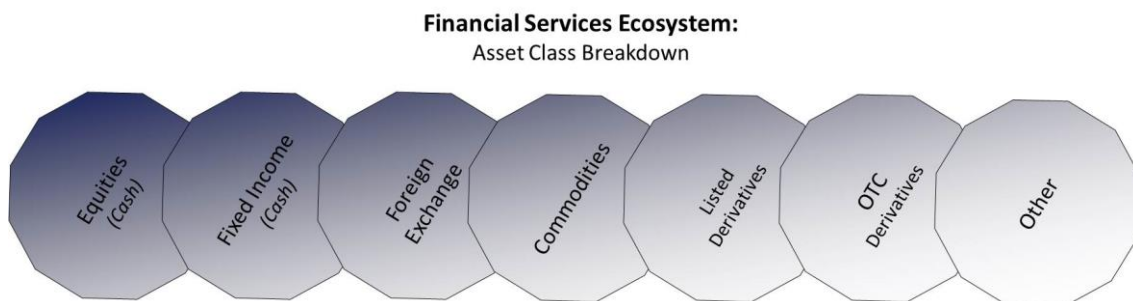
Source: Alphacution

Exhibit 10: Core Regional Taxonomy



Source: Alphacution

Exhibit 11: Asset Class Taxonomy



Source: Alphacution

Proprietary Model Dictionary

Exhibit 12: Alphacution Proprietary Model Dictionary - Company Models 1-30

Metadata					Raw Data (Annual)												
#	Profile	Company	Country	FX	FYE	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16
1	Bank	ABN Amro Group NV	Netherlands	EUR	Dec	z	x	x	x	x	x	x	x	x	x	x	
2	Bank	Agricultural Bank of China, Ltd.	China	CNY	Dec	x	x	x	x	x	x	x	x	x	x		
3	Bank	Australia and New Zealand Banking Group, Ltd.	Australia	AUD	Sep	x	x	x	x	x	x	x	x	x	x	x	
4	Bank	Banco Bilbao Vizcaya Argentaria SA (BBVA)	Spain	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
5	Bank	Banco do Brasil SA	Brazil	BRL	Dec	x	x	x	x	x	x	x	x	x	x	x	
6	Bank	Banco Santander SA	Spain	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
7	Bank	Bank of America Corp.	US	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
8	Bank	Bank of China, Ltd.	China	CNY	Dec	x	x	x	x	x	x	x	x	x	x		
9	Bank	BMO Financial Group	Canada	CAD	Oct	z	x	x	x	x	x	x	x	x	x	x	
10	Bank	Bank of New York Mellon Corp.	US	USD	Dec	z	x	x	x	x	x	x	x	x	x	x	
11	Bank	Bank of Nova Scotia	Canada	CAD	Dec	x	x	x	x	x	x	x	x	x	x	x	
12	Bank	Barclays Plc	UK	GBP	Dec	x	x	x	x	x	x	x	x	x	x	x	
13	Broker / Dealer	BGC Partners, Inc.	US	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
14	Bank	BNP Paribas SA	France	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
15	Bank	Canadian Imperial Bank of Commerce	Canada	CAD	Oct	z	x	x	x	x	x	x	x	x	x	x	
16	Bank	China Construction Bank Corp.	China	CNY	Dec	z	x	x	x	x	x	x	x	x	x		
17	Bank	Citigroup, Inc.	US	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
18	Bank	Comerica, Inc.	US	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
19	Bank	Commerzbank AG	Germany	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
20	Bank	Commonwealth Bank of Australia	Australia	AUD	Jun	z	x	x	x	x	x	x	x	x	x		
21	Bank	Credit Agricole Group	France	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
22	Bank	Credit Suisse Group AG	Switzerland	CHF	Dec	x	x	x	x	x	x	x	x	x	x	x	
23	Broker / Dealer	Daiwa Securities Group, Inc.	Japan	JPY	Mar	x	x	x	x	x	x	x	x	x	x	x	
24	Bank	Danske Bank A/S	Denmark	DKK	Dec	x	x	x	x	x	x	x	x	x	x	x	
25	Bank	Deutsche Bank AG	Germany	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
26	Bank	Development Bank of Singapore	Singapore	SGD	Dec	x	x	x	x	x	x	x	x	x	x	z	
27	Bank	Fifth Third Bancorp	US	USD	Dec	z	x	x	x	x	x	x	x	x	x	x	
28	Bank	Goldman Sachs Group, Inc.	US	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
29	Bank	Groupe BPCE	France	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
30	Bank	HSBC Holdings Plc	UK	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	

x = annual report, regulatory report or related documentation on file; y = company data prior to acquisition or related transaction; z = verifiable data from different year; p = private company for this and prior periods.

Exhibit 13: Alphacution Proprietary Model Dictionary - Company Models 31-60

Metadata					Raw Data (Annual)												
#	Profile	Company	Country	FX	FYE	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16
31	Bank	Industrial and Commercial Bank of China, Ltd.	China	CNY	Dec	x	x	x	x	x	x	x	x	x	x	x	
32	Bank	ING Bank NV	Netherlands	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
33	Bank	Intesa Sanpaolo SpA	Italy	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
34	Bank	Itau Unibanco Holding SA	Brazil	BRL	Dec	x	x	x	x	x	x	x	x	x	x	x	
35	Broker / Dealer	Jefferies Group LLC	US	USD	Dec	z	x	x	x	x	x	x	x	x	x	x	
36	Bank	JP Morgan Chase & Co.	US	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
37	Bank	KeyCorp	US	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
38	Bank	Lloyds Banking Group Plc	UK	GBP	Dec	x	x	x	x	x	x	x	x	x	x	x	
39	Bank	Mitsubishi UFJ Financial Group, Inc.	Japan	JPY	Mar	z	x	x	x	x	x	x	x	x	x	x	
40	Bank	Mizuho Financial Group Inc.	Japan	JPY	Mar	x	x	x	x	x	x	x	x	x	x	x	
41	Bank	Morgan Stanley	US	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
42	Bank	National Australia Bank, Ltd.	Australia	AUD	Sep	x	x	x	x	x	x	x	x	x	x	x	
43	Bank	Nomura Holdings, Inc.	Japan	JPY	Mar	x	x	x	x	x	x	x	x	x	x	x	
44	Bank	Nordea Bank AB	Sweden	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
45	Bank	Northern Trust Corp.	US	USD	Dec	z	x	x	x	x	x	x	x	x	x	x	
46	Bank	PNC Financial Services Group, Inc.	US	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
47	Bank	Rabobank Group	Netherlands	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
48	Bank	Royal Bank of Canada	Canada	CAD	Oct	z	x	x	x	x	x	x	x	x	x	x	
49	Bank	Royal Bank of Scotland Group Plc	UK	GBP	Dec	z	x	x	x	x	x	x	x	x	x	x	
50	Bank	Société Générale	France	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
51	Bank	Standard Chartered Bank	UK	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
52	Bank	State Street Corp.	US	USD	Dec	z	x	x	x	x	x	x	x	x	x	x	
53	Bank	Sumitomo Mitsui Financial Group Inc.	Japan	JPY	Mar	x	x	x	x	x	x	x	x	x	x	x	
54	Bank	Toronto-Dominion Bank (TD Bank)	Canada	CAD	Oct	x	x	x	x	x	x	x	x	x	x	x	
55	Bank	UBS Group AG	Switzerland	CHF	Dec	x	x	x	x	x	x	x	x	x	x	x	
56	Bank	Unicredit Group SpA	Italy	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	
57	Bank	US Bancorp	US	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
58	Bank	Wells Fargo & Co.	US	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
59	IT Services	Accenture	Ireland	USD	Aug	x	x	x	x	x	x	x	x	x	x	x	
60	IT Services	Atos Origin	France	EUR	Dec	x	x	x	x	x	x	x	x	x	x	x	

x = annual report, regulatory report or related documentation on file; y = company data prior to acquisition or related transaction; z = verifiable data from different year; p = private company for this and prior periods.

Exhibit 14: Alphacution Proprietary Model Dictionary - Company Models 61-78 and others

Metadata					Raw Data (Annual)												
#	Profile	Company	Country	FX	FYE	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16
61	IT Services	CapGemini	France	EUR	Dec	z	z	z	x	x	x	x	x	x	x	x	
62	IT Services	CGI Group	Canada	CAD	Sep	x	x	x	x	x	x	x	x	x	x	x	
63	IT Services	Cognizant	United States	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
64	IT Services	Computer Sciences Corp. (CSC)	United States	USD	Mar	x	x	x	x	x	x	x	x	x	x	x	x
65	IT Services	Exlservice Holdings	United States	USD	Dec	z	x	x	x	x	x	x	x	x	x	x	
66	IT Services	Firstsource Solutions	India	INR	Mar	p	z	x	x	x	x	x	x	x	x	x	x
67	IT Services	Genpact	Bermuda	USD	Dec	z	z	x	x	x	x	x	x	x	x	x	
68	IT Services	HCL Technologies	India	INR	Jun		x	x	x	x	x	x	x	x	x	x	x
69	IT Services	Hexaware	India	INR	Dec	x	x	x	x	x	x	x	x	x	x	x	
70	IT Services	Infosys	India	INR	Mar	x	x	x	x	x	x	x	x	x	x	x	x
71	IT Services	MindTree	India	INR	Mar	p	z	x	x	x	x	x	x	x	x	x	x
72	IT Services	Mphasis	India	INR	Mar	p	z	x	x	x	x	x	x	x	x	x	x
73	IT Services	Satyam Computer Services (Mahindra Satyam)	India	INR	Mar					y	y	y	y				
74	IT Services	Tata Consultancy Services (TCS)	India	INR	Mar		x	x	x	x	x	x	x	x	x	x	x
75	IT Services	Tech Mahindra	India	INR	Mar	x	x	x	x	x	x	x	x	x	x	x	x
76	IT Services	Unisys	United States	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
77	IT Services	Wipro	India	INR	Mar		x	x	x	x	x	x	x	x	x	x	x
78	IT Services	WNS Global Solutions	India	INR	Mar	z	z	x	x	x	x	x	x	x	x	x	x
82	Enterprise	Fujitsu	Japan	JPY	Mar	x	x	x	x	x	x	x	x	x	x	x	x
83	Enterprise	Hewlett Packard Enterprise (HPE)	United States	USD	Oct									z	z	x	
85	Enterprise	HP Inc.	United States	USD	Oct	x	x	x	x	x	x	x	x	x	x	x	
86	Enterprise	IBM	United States	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
90	Enterprise	NTT Data	Japan	JPY	Mar	x	x	x	x	x	x	x	x	x	x	x	x
116	Big FinTech	Morningstar	United States	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
135	Asset Mgmt	Blackrock	United States	USD	Dec	x	x	x	x	x	x	x	x	x	x	x	
139	Asset Mgmt	Franklin Templeton	United States	USD	Sep	z	x	x	x	x	x	x	x	x	x	x	
203	Market Maker	Virtu Financial	United States	USD	Dec						< p	z	z	z	x	x	
204	Market Maker	KCG (Getco)	United States	USD	Dec		< p	z	z	z	z	z	z	x	x	x	
206	Digital	Facebook, Inc.	United States	USD	Dec										x	x	
207	Digital	Netflix, Inc.	United States	USD	Dec									x	x	x	
208	Digital	Amazon.com, Inc.	United States	USD	Dec									x	x	x	
209	Digital	Google	United States	USD	Dec										x	x	
223	Hedge Fund / PE	Blackstone Group LP	United States	USD	Dec	z	z	x	x	x	x	x	x	x	x	x	

x = annual report, regulatory report or related documentation on file; y = company data prior to acquisition or related transaction; z = verifiable data from different year; p = private company for this and prior periods.

Exhibit Bibliography

Exhibit 15: Open and Premium Exhibits Bibliography – Exhibits 239-278

#	Library	Link	P-Date	Exhibit Title	Company	Profile	Theme
278	Open	Feed	12-Jan-17	Virtu_Revenue by Country_Q114Q316	Virtu Financial, Inc.	Mkt Maker	HFT
277	Open	Feed	12-Jan-17	Virtu Financial_RPE Analysis Q114Q316	Virtu Financial, Inc.	Mkt Maker	HFT
276	Open	Feed	10-Jan-17	List of RoboAdvisors_Dec 2016		Asset Mgmt	Robo-Advisors
275	Prem	Exclusive	5-Jan-17	Banks Composite_Top 10 Enterprise TCO_2015		Bank	Enterprise TCO
274	Prem	Exclusive	5-Jan-17	Banks Composite_Top 10 Headcount_2015 v3		Bank	Headcount
273	Prem	Exclusive	5-Jan-17	Banks Composite_Top 10 Revenue per Employee_2015 v3		Bank	RPE
272	Prem	Exclusive	5-Jan-17	Banks Composite_Top 10 Revenue_2015 v7		Bank	Revenue
271	Prem	Exclusive	5-Jan-17	Banks Composite_Top 10 T-Alpha_2015		Bank	T-Alpha
270	Prem	Exclusive	5-Jan-17	Banks Composite_Top 10 T-Spread_2015 v5		Bank	T-Spread
269	Prem	Exclusive	5-Jan-17	Banks Composite_Top 10 T-Theta_2015		Bank	T-Theta
268	Prem	Exclusive	22-Dec-16	Agri Bank of China eTCO Breakdown 2005-2015	Agricultural Bank of China, Ltd.	Bank	Enterprise TCO
267	Prem	Exclusive	22-Dec-16	Bank of China eTCO Breakdown 2005-2015	Bank of China, Ltd.	Bank	Enterprise TCO
266	Prem	Exclusive	22-Dec-16	CCB eTCO Breakdown 2005-2015	China Construction Bank Corp.	Bank	Enterprise TCO
265	Prem	Exclusive	22-Dec-16	Daiwa eTCO Breakdown 2005-2015	Daiwa Securities Group, Inc.	Bank	Enterprise TCO
264	Prem	Exclusive	22-Dec-16	DBS eTCO Breakdown 2005-2015	Development Bank of Singapore	Bank	Enterprise TCO
263	Prem	Exclusive	22-Dec-16	ICBC eTCO Breakdown 2005-2015	Industrial and Commercial Bank of China, Ltd.	Bank	Enterprise TCO
262	Prem	Exclusive	22-Dec-16	MUFJ eTCO Breakdown 2005-2015	Mitsubishi UFJ Financial Group, Inc.	Bank	Enterprise TCO
261	Prem	Exclusive	22-Dec-16	Nomura eTCO Breakdown 2005-2015	Nomura Holdings, Inc.	Bank	Enterprise TCO
260	Prem	Exclusive	22-Dec-16	Sumitomo eTCO Breakdown 2005-2015	Sumitomo Mitsui Financial Group, Inc.	Bank	Enterprise TCO
259	Prem	Exclusive	21-Dec-16	ABN Amro eTCO Breakdown 2005-2015	ABN Amro Group NV	Bank	Enterprise TCO
258	Prem	Exclusive	21-Dec-16	ANZ eTCO Breakdown 2005-2015	Australia and New Zealand Banking Group, Ltd.	Bank	Enterprise TCO
257	Prem	Exclusive	21-Dec-16	BBVA eTCO Breakdown 2005-2015	Banco Bilbao Vizcaya Argentaria SA (BBVA)	Bank	Enterprise TCO
256	Prem	Exclusive	21-Dec-16	BNPP eTCO Breakdown 2005-2015	BNP Paribas SA	Bank	Enterprise TCO
255	Prem	Exclusive	21-Dec-16	BPCE eTCO Breakdown 2005-2015	Groupe BPCE	Bank	Enterprise TCO
254	Prem	Exclusive	21-Dec-16	CASA eTCO Breakdown 2005-2015	Credit Agricole Group	Bank	Enterprise TCO
253	Prem	Exclusive	21-Dec-16	CBA eTCO Breakdown 2005-2015	Commonwealth Bank of Australia	Bank	Enterprise TCO
252	Prem	Exclusive	21-Dec-16	CS eTCO Breakdown 2005-2015	Credit Suisse Group AG	Bank	Enterprise TCO
251	Prem	Exclusive	21-Dec-16	Danske eTCO Breakdown 2005-2015	Danske Bank A/S	Bank	Enterprise TCO
250	Prem	Exclusive	21-Dec-16	ING eTCO Breakdown 2005-2015	ING Bank NV	Bank	Enterprise TCO
249	Prem	Exclusive	21-Dec-16	Intesa eTCO Breakdown 2005-2015	Intesa Sanpaolo SpA	Bank	Enterprise TCO
248	Prem	Exclusive	21-Dec-16	NAB eTCO Breakdown 2005-2015	National Australia Bank, Ltd.	Bank	Enterprise TCO
247	Prem	Exclusive	21-Dec-16	Nordea eTCO Breakdown 2005-2015	Nordea Bank AB	Bank	Enterprise TCO
246	Prem	Exclusive	21-Dec-16	Rabobank eTCO Breakdown 2005-2015	Rabobank Group	Bank	Enterprise TCO
245	Prem	Exclusive	21-Dec-16	Santander eTCO Breakdown 2005-2015	Banco Santander SA	Bank	Enterprise TCO
244	Prem	Exclusive	21-Dec-16	SocGen eTCO Breakdown 2005-2015	Société Générale Group SA	Bank	Enterprise TCO
243	Prem	Exclusive	21-Dec-16	UBS eTCO Breakdown 2005-2015	UBS Group AG	Bank	Enterprise TCO
242	Prem	Exclusive	21-Dec-16	UniCredit eTCO Breakdown 2005-2015	UniCredit SpA	Bank	Enterprise TCO
241	Prem	Exclusive	20-Dec-16	Barclays eTCO Breakdown 2005-2015	Barclays plc	Bank	Enterprise TCO
240	Prem	Exclusive	20-Dec-16	BMO eTCO Breakdown_20052015	BMO Financial Group	Bank	Enterprise TCO
239	Prem	Exclusive	20-Dec-16	CIBC eTCO Breakdown 2005-2015	Canadian Imperial Bank of Commerce	Bank	Enterprise TCO

Exhibit 16: Open and Premium Exhibits Bibliography – Exhibits 199-238

#	Library	Link	P-Date	Exhibit Title	Company	Profile	Theme
238	Prem	Exclusive	20-Dec-16	CZB eTCO Breakdown 2005-2015	Commerzbank AG	Bank	Enterprise TCO
237	Prem	Exclusive	20-Dec-16	DB eTCO Breakdown 2005-2015	Deutsche Bank AG	Bank	Enterprise TCO
236	Prem	Exclusive	20-Dec-16	DB eTCO Comparison 2005-2015	Deutsche Bank AG	Bank	Enterprise TCO
235	Prem	Exclusive	20-Dec-16	DB Model v Reported IT Human Capital 2005 - 2015	Deutsche Bank AG	Bank	TCO Components
234	Prem	Exclusive	20-Dec-16	HSBC eTCO Breakdown 2005-2015	HSBC Holdings plc	Bank	Enterprise TCO
233	Prem	Exclusive	20-Dec-16	Itau eTCO Breakdown 2005-2015	Itau Unibanco Holding SA	Bank	Enterprise TCO
232	Prem	Exclusive	20-Dec-16	Lloyds eTCO Breakdown 2005 2015	Lloyds Banking Group plc	Bank	Enterprise TCO
231	Prem	Exclusive	20-Dec-16	RBC eTCO Breakdown 2005 2015	Royal Bank of Canada	Bank	Enterprise TCO
230	Prem	Exclusive	20-Dec-16	RBS eTCO Breakdown 2005-2015	Royal Bank of Scotland Group plc	Bank	Enterprise TCO
229	Prem	Exclusive	20-Dec-16	Scotiabank eTCO Breakdown 2005 2015	Scotiabank / Bank of Nova Scotia	Bank	Enterprise TCO
228	Prem	Exclusive	20-Dec-16	Standard Chartered eTCO Breakdown 2005-2015	Standard Chartered Bank	Bank	Enterprise TCO
227	Prem	Exclusive	20-Dec-16	TD Bank eTCO Breakdown 2005-2015	TD Bank Group	Bank	Enterprise TCO
226	Prem	Exclusive	20-Dec-16	WF eTCO Breakdown 2005-2015	Wells Fargo & Co.	Bank	Enterprise TCO
225	Prem	Exclusive	19-Dec-16	53 eTCO Breakdown 2005-2015	Fifth Third Bancorp	Bank	Enterprise TCO
224	Prem	Exclusive	19-Dec-16	BAML eTCO Breakdown (Bars) 2005-2015	Bank of America Corp.	Bank	Enterprise TCO
223	Prem	Exclusive	19-Dec-16	BAML eTCO Breakdown 2005-2015	Bank of America Corp.	Bank	Enterprise TCO
222	Prem	Exclusive	19-Dec-16	Banco do Brasil eTCO Breakdown 2005-2015	Banco do Brasil SA	Bank	Enterprise TCO
221	Prem	Exclusive	19-Dec-16	BGC Partners eTCO Breakdown 2005-2015	BGC Partners, Inc.	Bank	Enterprise TCO
220	Prem	Exclusive	19-Dec-16	BNYM AUC per Employee 2005-2015	Bank of New York Mellon Corp.	Bank	AuX
219	Prem	Exclusive	19-Dec-16	BNYM eTCO Breakdown 2005-2015	Bank of New York Mellon Corp.	Bank	Enterprise TCO
218	Prem	Exclusive	19-Dec-16	Citi eTCO Breakdown 2005-2015	Citigroup, Inc.	Bank	Enterprise TCO
217	Prem	Exclusive	19-Dec-16	Comerica eTCO Breakdown 2005-2015	Comerica, Inc.	Bank	Enterprise TCO
216	Prem	Exclusive	19-Dec-16	DB Quarterly Hardware / Software Spend Q1/11-Q2/16	Deutsche Bank AG	Bank	TCO Components
215	Prem	Exclusive	19-Dec-16	DB Quarterly Headcount Q1/11-Q3/16	Deutsche Bank AG	Bank	Headcount
214	Prem	Exclusive	19-Dec-16	GS eTCO Breakdown 2005-2015	Goldman Sachs Group, Inc.	Bank	Enterprise TCO
213	Prem	Exclusive	19-Dec-16	Jefco eTCO Breakdown 2005-2015	Jefferies Group LLC	Bank	Enterprise TCO
212	Prem	Exclusive	19-Dec-16	JPMC eTCO Breakdown 2005-2015	JP Morgan Chase & Co.	Bank	Enterprise TCO
211	Prem	Exclusive	19-Dec-16	Key Bank eTCO Breakdown 2005-2015	KeyCorp	Bank	Enterprise TCO
210	Prem	Exclusive	19-Dec-16	MS eTCO Breakdown 2005-2015	Morgan Stanley	Bank	Enterprise TCO
209	Prem	Exclusive	19-Dec-16	NT AUC per Employee 2005-2015	Northern Trust Corp.	Bank	AuX
208	Prem	Exclusive	19-Dec-16	NT eTCO Breakdown 2005-2015	Northern Trust Corp.	Bank	Enterprise TCO
207	Prem	Exclusive	19-Dec-16	PNC eTCO Breakdown 2005-2015	PNC Financial Services Group, Inc.	Bank	Enterprise TCO
206	Prem	Exclusive	19-Dec-16	STT eTCO Breakdown 2005 2015	State Street Corp.	Bank	Enterprise TCO
205	Prem	Exclusive	19-Dec-16	US Bancorp eTCO Breakdown 2005-2015	U S Bancorp	Bank	Enterprise TCO
204	Open	Feed	15-Dec-16	Virtu_Trading Revenue per Employee 20112015	Virtu Financial, Inc.	Mkt Maker	HFT
203	Open	Feed	15-Dec-16	Virtu_Avg Daily Trading Revenue 20112015	Virtu Financial, Inc.	Mkt Maker	HFT
202	Open	Feed	14-Dec-16	Top Hedge Funds_AUM per Employee 2016 v2		HF	Hedge Funds
201	Prem	Exclusive	14-Dec-16	Barclays Software Asset Analysis 2005-2014	Barclays plc	Bank	TCO Components
200	Prem	Exclusive	14-Dec-16	Commerzbank Hardware / Software Spend Analysis 2005-2015	Commerzbank AG	Bank	TCO Components
199	Prem	Exclusive	14-Dec-16	DB Annotated TCO Comparison 2005-2015	Deutsche Bank AG	Bank	Enterprise TCO

Exhibit 17: Open and Premium Exhibits Bibliography – Exhibits 159-198

#	Library	Link	P-Date	Exhibit Title	Company	Profile	Theme
198	Prem	Exclusive	14-Dec-16	DB FX TCO Impact Q1/11 - Q4/15	Deutsche Bank AG	Bank	TCO Components
197	Prem	Exclusive	14-Dec-16	DB Reported Technology Expense Analysis (2005-2015) v2.2	Deutsche Bank AG	Bank	TCO Components
196	Prem	Exclusive	14-Dec-16	DB Software Asset Analysis (2005-2015) v3	Deutsche Bank AG	Bank	TCO Components
195	Prem	Exclusive	14-Dec-16	DB Software Spend Analysis 2006-2015	Deutsche Bank AG	Bank	TCO Components
194	Prem	Exclusive	14-Dec-16	JPMC Segment Headcount 2005-2015	JP Morgan Chase & Co.	Bank	Headcount
193	Prem	Exclusive	14-Dec-16	Lloyds Hardware / Software Asset Analysis 2005-2014	Lloyds Banking Group plc	Bank	TCO Components
192	Prem	Exclusive	14-Dec-16	Nordea Software Asset Analysis 2005-2015	Nordea Bank AB	Bank	TCO Components
191	Prem	Exclusive	14-Dec-16	RBS Hardware and Software Assets 2005-2015	Royal Bank of Scotland Group plc	Bank	TCO Components
190	Open	Feed	4-Oct-16	ING Group_ Headcount historical and projections 20161003	ING Group NV	Bank	Headcount
189	Open	Feed	4-Oct-16	ING Group_ Post GFC Divestitures 20161003	ING Group NV	Bank	Divestitures
188	Open	Feed	23-Sep-16	Technology Stack Taxonomy		General	Research Roadmap
187	Open	Feed	23-Sep-16	Regional Breakdown / Taxonomy		General	Research Roadmap
186	Open	Feed	23-Sep-16	Horizontal Workflows Taxonomy_Front to Back		General	Research Roadmap
185	Open	Feed	23-Sep-16	Counterparty Taxonomy_Buyers Sellers and Referees		General	Research Roadmap
184	Open	Feed	23-Sep-16	Asset Class Breakdown / Taxonomy		General	Research Roadmap
183	Open	Report	21-Sep-16	T-Greeks for Custodian Banks 2015		Bank	T-Greeks
182	Open	Feed	20-Sep-16	Analog Digital Gap for Banks_Bubble Chart_20160916 v7		Digital	Digital Frontier
181	Open	Feed	14-Sep-16	Large European Bank_Total Quarterly Headcount Q111Q216 20160913		Bank	Headcount
180	Open	Feed	14-Sep-16	Large European Bank_Total Quarterly Headcount 20160912		Bank	Headcount
179	Open	Feed	14-Sep-16	Large European Bank_Segment Headcount Index 20160912 v2		Bank	Headcount
178	Open	Feed	14-Sep-16	Large European Bank_Front v Back Headcount Index 20160912		Bank	Headcount
177	Open	Feed	14-Sep-16	Goldman Sachs_Total Quarterly Headcount 2004Q216 20160913 v2	Goldman Sachs Group, Inc.	Bank	Headcount
176	Prem	Exclusive	12-Jul-16	ABN Amro Business Segment Headcount (2009-2015) v3	ABN Amro Group NV	Bank	Headcount
175	Prem	Exclusive	12-Jul-16	ABN Amro Business Segment RPE (2010-2015) v3	ABN Amro Group NV	Bank	Revenue
174	Prem	Exclusive	12-Jul-16	ABN Amro Technology Asset Analysis (2009-2015) v3	ABN Amro Group NV	Bank	TCO Components
173	Prem	Exclusive	12-Jul-16	ANZ Technology Asset Analysis (2005-2015) v3	Australia and New Zealand Banking Group, Ltd.	Bank	TCO Components
172	Prem	Exclusive	12-Jul-16	Banco do Brasil Technology Asset Analysis (2005-2015) v3	Banco do Brasil SA	Bank	TCO Components
171	Prem	Exclusive	12-Jul-16	BBVA Acquired Software (2005-2015) v3	Banco Bilbao Vizcaya Argentaria SA (BBVA)	Bank	TCO Components
170	Prem	Exclusive	12-Jul-16	BNYM Capitalized Software (2005-2015) v3	Bank of New York Mellon Corp.	Bank	TCO Components
169	Prem	Exclusive	12-Jul-16	CIBC Business Segment RPE (2009-2015) v3	Canadian Imperial Bank of Commerce	Bank	Revenue
168	Prem	Exclusive	12-Jul-16	CIBC Hardware / Software Asset Analysis (2005-2015) v3	Canadian Imperial Bank of Commerce	Bank	TCO Components
167	Prem	Exclusive	12-Jul-16	CS Business Segment RPE (2005-2014) v3	Credit Suisse Group AG	Bank	Revenue
166	Prem	Exclusive	12-Jul-16	CS Group RPE (2005-2015); Segment RPE (2013-2015)	Credit Suisse Group AG	Bank	Revenue
165	Prem	Exclusive	12-Jul-16	CS Regional RPE (2005-2015) v3	Credit Suisse Group AG	Bank	Revenue
164	Prem	Exclusive	12-Jul-16	GS Segment Depreciation / Amortization Analysis (2005-2015) v3	Goldman Sachs Group, Inc.	Bank	TCO Components
163	Prem	Exclusive	12-Jul-16	ING Business Segment RPE (2005-2015) v3	ING Bank NV	Bank	Revenue
162	Prem	Exclusive	12-Jul-16	ING Hardware / Software Asset Analysis (2005-2015) v3	ING Bank NV	Bank	TCO Components
161	Prem	Exclusive	12-Jul-16	ING RPE by Country 2015	ING Bank NV	Bank	Revenue
160	Prem	Exclusive	12-Jul-16	Intesa Hardware / Software Asset Analysis (2005-2015) v3	Intesa Sanpaolo SpA	Bank	TCO Components
159	Prem	Exclusive	12-Jul-16	NAB Technology Asset Analysis (2005-2015) v2.1	National Australia Bank, Ltd.	Bank	TCO Components

Exhibit 18: Open and Premium Exhibits Bibliography – Exhibits 119-158

#	Library	Link	P-Date	Exhibit Title	Company	Profile	Theme
158	Prem	Exclusive	12-Jul-16	NT Capital Expenditure Allocations (2007-2015) v2	Northern Trust Corp.	Bank	TCO Components
157	Prem	Exclusive	12-Jul-16	NT Capital Expenditure Breakdown (2005-2015) v3	Northern Trust Corp.	Bank	TCO Components
156	Prem	Exclusive	12-Jul-16	Santander Business Segment RPE (2005-2015) v3	Banco Santander SA	Bank	Revenue
155	Prem	Exclusive	12-Jul-16	Santander Hardware / Software Asset Analysis (2005-2015) v3	Banco Santander SA	Bank	TCO Components
154	Prem	Exclusive	12-Jul-16	Santander Regional RPE (2005-2015) v3	Banco Santander SA	Bank	Revenue
153	Prem	Exclusive	12-Jul-16	Scotiabank Hardware/Software Asset Analysis (2005-2015) v3	Scotiabank / Bank of Nova Scotia	Bank	TCO Components
152	Prem	Exclusive	12-Jul-16	TD Bank Hardware / Software Asset Analysis (2004-2015) v3	TD Bank Group	Bank	TCO Components
151	Prem	Exclusive	12-Jul-16	UBS Investment Bank RPE (2008-2015) v3	UBS Group AG	Bank	Revenue
150	Prem	Exclusive	12-Jul-16	UBS Regional RPE (2005-2015) v3	UBS Group AG	Bank	Revenue
149	Prem	Exclusive	12-Jul-16	UBS Segment RPE (2009-2015) v3	UBS Group AG	Bank	Revenue
148	Prem	Exclusive	12-Jul-16	UBS Select Country RPE (2005-2015) v3	UBS Group AG	Bank	Revenue
147	Prem	Exclusive	12-Jul-16	UniCredit Hardware / Software Asset Analysis (2005-2015) v3	UniCredit SpA	Bank	TCO Components
146	Prem	Exclusive	12-Jul-16	WF Annual Segment Equipment Expense 2005-2015 v3	Wells Fargo & Co.	Bank	TCO Components
145	Prem	Exclusive	12-Jul-16	WF Telco Expense per FTE 2005-2015 v3	Wells Fargo & Co.	Bank	Telco
144	Prem	Exclusive	11-Jul-16	UBS Technology Asset Analysis (2005-2015) v2	UBS Group AG	Bank	TCO Components
143	Prem	Exclusive	8-Jul-16	Barclays Technology Asset Analysis 2005-2015	Barclays plc	Bank	TCO Components
142	Prem	Exclusive	8-Jul-16	CS Technology Asset Analysis (2005-2015) v2	Credit Suisse Group AG	Bank	TCO Components
141	Prem	Exclusive	8-Jul-16	CS Outsourcing vs Insourcing (2005-2015)	Credit Suisse Group AG	Bank	TCO Components
140	Prem	Exclusive	8-Jul-16	DB Outsourcing vs Insourcing Proxy (2005-2015)	Deutsche Bank AG	Bank	TCO Components
139	Prem	Exclusive	8-Jul-16	DB Quarterly Hardware/Software Spend Q1/11 - Q4/15	Deutsche Bank AG	Bank	TCO Components
138	Prem	Exclusive	8-Jul-16	DB Technology Expense Analysis (2005-2015) v3	Deutsche Bank AG	Bank	TCO Components
137	Prem	Exclusive	8-Jul-16	HSBC Software Asset Analysis (2005-2015)	HSBC Holdings plc	Bank	TCO Components
136	Prem	Exclusive	8-Jul-16	Lloyds Technology Asset Analysis (2005-2015) v2	Lloyds Banking Group plc	Bank	TCO Components
135	Prem	Exclusive	8-Jul-16	NAB Annual Change in Net Technology Assets (2006-2015) v2	National Australia Bank, Ltd.	Bank	TCO Components
134	Prem	Exclusive	8-Jul-16	Rabobank Bank User Trends 2011-2015	Rabobank Group	Bank	
133	Prem	Exclusive	8-Jul-16	Ratio: NHC Tech Spending to Total Revenue, Average 2005-2014		Bank	TCO Components
132	Prem	Exclusive	6-Jul-16	DB Annual Change - Hardware vs Software Spend (2006-2015) v2	Deutsche Bank AG	Bank	
131	Prem	Exclusive	6-Jul-16	BBVA Regional RPE (2010-2011) v2	Banco Bilbao Vizcaya Argentaria SA (BBVA)	Bank	Revenue
130	Prem	Exclusive	6-Jul-16	BMO Business Segment RPE v2 (2005-2015)	BMO Financial Group	Bank	Revenue
129	Prem	Exclusive	6-Jul-16	BMO Technology Asset Analysis v2 (2008-2015)	BMO Financial Group	Bank	TCO Components
128	Prem	Exclusive	6-Jul-16	BNPP Software Asset Analysis v2 (2005-2015)	BNP Paribas SA	Bank	TCO Components
127	Prem	Exclusive	6-Jul-16	CBA Technology Asset Analysis v2 (2006-2015)	Commonwealth Bank of Australia	Bank	TCO Components
126	Prem	Exclusive	6-Jul-16	DB Business Segment Headcount Indices (2009-2015) v2	Deutsche Bank AG	Bank	Headcount
125	Prem	Exclusive	6-Jul-16	DB Business Segment RPE (2010-2015) v3	Deutsche Bank AG	Bank	Revenue
124	Prem	Exclusive	6-Jul-16	DB Headcount Segmentation (2011-2015) v2	Deutsche Bank AG	Bank	Headcount
123	Prem	Exclusive	6-Jul-16	DB Operations Headcount by Segment (2009-2015) v2	Deutsche Bank AG	Bank	Headcount
122	Prem	Exclusive	6-Jul-16	GS Business Segment RPE (Q3-10 / Q4-15) v2	Goldman Sachs Group, Inc.	Bank	Revenue
121	Prem	Exclusive	6-Jul-16	GS Total Enterprise Headcount (2004-2009, Q1/09 - Q4/15) v2	Goldman Sachs Group, Inc.	Bank	Headcount
120	Prem	Exclusive	6-Jul-16	GS Total Headcount (2004-2015) v2	Goldman Sachs Group, Inc.	Bank	Headcount
119	Prem	Exclusive	6-Jul-16	Mitsubishi Net Software Assets (2005-2015) v2	Mitsubishi UFJ Financial Group, Inc.	Bank	TCO Components

Exhibit 19: Open and Premium Exhibits Bibliography – Exhibits 79-118

#	Library	Link	P-Date	Exhibit Title	Company	Profile	Theme
118	Prem	Exclusive	6-Jul-16	Mitsubishi_Capitalized Leases Data Processing Equipment (2005-2015)	Mitsubishi UFJ Financial Group, Inc.	Bank	TCO Components
117	Prem	Exclusive	6-Jul-16	NT Qtr (Q1-05/Q3-15) / Yr (2005-2014) Equipment / Software Exp	Northern Trust Corp.	Bank	TCO Components
116	Prem	Exclusive	6-Jul-16	NT Software Spending Indicators (2005-2015) v2	Northern Trust Corp.	Bank	TCO Components
115	Prem	Exclusive	6-Jul-16	RBC Business Segment RPE (2005-2015) v2	Royal Bank of Canada	Bank	Revenue
114	Prem	Exclusive	6-Jul-16	RBC Technology Asset Analysis (2005-2015) v2	Royal Bank of Canada	Bank	TCO Components
113	Prem	Exclusive	6-Jul-16	SMFG Software Investment Trend (2008-2015)v2	Sumitomo Mitsui Financial Group, Inc.	Bank	TCO Components
112	Prem	Exclusive	6-Jul-16	Technology Expense by Model Ranking (2014) v2		Bank	TCO Components
111	Prem	Exclusive	6-Jul-16	WF Quarterly Equipment / Software Expense (Q1-04 / Q3-15) v2	Wells Fargo & Co.	Bank	TCO Components
110	Prem	Exclusive	6-Jul-16	WF Quarterly Segment Equipment / Software Spend (Q1-14 / Q3-15) v2	Wells Fargo & Co.	Bank	TCO Components
109	Open	Report	28-Jun-16	16.0134OBA Foreshadowing T-Spread Benchmarking 58 Global Banks		Bank	Benchmark
108	Open	Report	28-Jun-16	16.0200OBA Visualizing T-Greeks Operational Analytics Framework		General	T-Greeks
107	Open	Report	28-Jun-16	16.0201OBA TSpread Benchmark 2015_58 Large Global Banks		Bank	Benchmark
106	Open	Report	28-Jun-16	Alternative View T-Spread Benchmark 2015_58 Large Global Banks		Bank	Benchmark
105	Open	Report	28-Jun-16	16.0203OBA TSpread Benchmark 2015_58 Large Global Banks by Region		Bank	Benchmark
104	Open	Report	28-Jun-16	16.0204OBA TSpread Benchmark 2015_58 Large Global Banks by Country		Bank	Benchmark
103	Open	Report	28-Jun-16	16.0205OBA Stdev of YoY Changes in RPE vs TPE		Bank	T-VOL
102	Open	Report	28-Jun-16	16.0206OBA T-Vol Dispersion Ranking Analysis		Bank	T-VOL
101	Prem	Exclusive	28-Jun-16	Model Hardware Software Spending_58 Banks_20160628		Bank	TCO Components
100	Prem	Exclusive	28-Jun-16	Model Total Net Headcount_58 Banks_20160628		Bank	Headcount
99	Prem	Exclusive	28-Jun-16	Sample and Global eTCO by Components_20160628		Bank	TCO
98	Prem	Exclusive	28-Jun-16	TCO per Employee by Workflow Category_20160628		Bank	Benchmarking
97	Open	Report	26-May-16	16.0116OBA Estimating IT-HC Spend Allocation for Enterprise TCO		Bank	TCO Components
96	Open	Report	26-May-16	Shape of US Banking Concentration for Global TCO Estimation		Bank	Market Sizing
95	Open	Report	26-May-16	16.0118OBA Sample and Global eTCO by Components		Bank	TCO Components
94	Open	Report	26-May-16	16.0119OBA Annual Change_TCO Component Allocation		Bank	TCO Components
93	Open	Report	26-May-16	16.0120OBA Cumulative Change Index_TCO Component Allocation		Bank	TCO Components
92	Open	Report	26-May-16	16.0121OBA TCO per Employee by Framework Component		Bank	TCO Components
91	Open	Report	26-May-16	16.0122OBA TCO per Employee by Region		Bank	TCO Components
90	Open	Report	26-May-16	16.0123OBA TCO per Employee by Country		Bank	TCO Components
89	Open	Report	26-May-16	16.0124OBA TCO per Employee by Workflow Category		Bank	TCO Components
88	Open	Report	26-May-16	16.0125OBA Workflow Category by Business Segment TPE Benchmarks		Bank	Benchmark
87	Open	Report	26-May-16	16.0126OBA Shifting TPE Benchmarks for Agility and Savings		General	Benchmark
86	Open	Report	26-May-16	16.0127OBA Modern Financial Complexity in US Banking		Bank	Banking Sector
85	Open	Report	26-May-16	16.0128OBA Pre-GFC Fragmentation in US Banking		Bank	Banking Sector
84	Open	Report	26-May-16	16.0129OBA Proprietary vs Managed Services Attribution Continuum		General	Instructional
83	Open	Report	26-May-16	16.0130OBA Resetting the Value Proposition		General	Instructional
82	Open	Report	26-May-16	16.0131OBA Weighted Average T-Spread for Sample Banks		Bank	T-Spread
81	Open	Report	26-May-16	16.0132OBA Weighted Average T-Spread for Sample Banks by Region		Bank	T-Spread
80	Open	Report	26-May-16	16.0133OBA Weighted Average T-Spread for Sample Banks by Country		Bank	T-Spread
79	Prem	Exclusive	26-May-16	Alternative View_TSpread Benchmark 2015_58 Large Global Banks		Bank	Benchmarking

Exhibit 20: Open and Premium Exhibits Bibliography – Exhibits 39-78

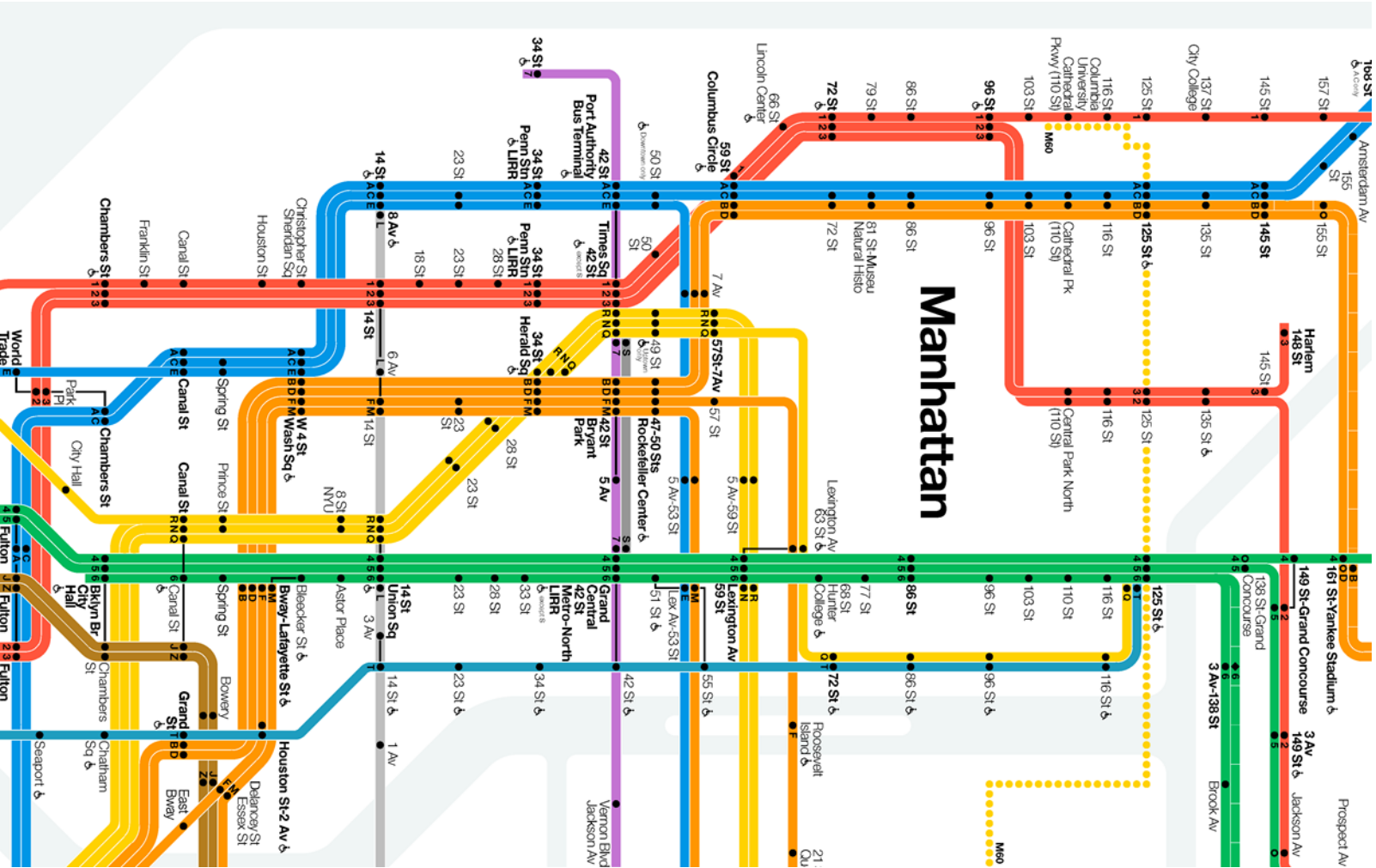
#	Library	Link	P-Date	Exhibit Title	Company	Profile	Theme
78	Prem	Exclusive	26-May-16	Annual Change_TCO Component Allocation_20160526		Bank	TCO Components
77	Prem	Exclusive	26-May-16	Contextual Expansion_Banks FANGs Apple Exxon_20169526		Bank	Benchmarking
76	Prem	Exclusive	26-May-16	Cumulative Change Index_TCO Component Allocation_20160526		Bank	TCO Components
75	Prem	Exclusive	26-May-16	Estimating ITHC Spend Allocation for Enterprise TCO_20160526		Bank	TCO Components
74	Prem	Exclusive	26-May-16	RPE Comparision_Banks FANGs Virtu 2014_20160526		Bank	Benchmarking
73	Prem	Exclusive	26-May-16	Sample and Global eTCO by Components_20160526		Bank	TCO
72	Prem	Exclusive	26-May-16	Shape of US Banking Concentration for Global TCO Estimation		Bank	TCO
71	Prem	Exclusive	26-May-16	Stdev of YoY Changes in RPE vs TPE_20160526		Bank	TCO Volatility
70	Prem	Exclusive	26-May-16	Total Net Revenue_58 Large Banks 20052015_20160526		Bank	Technical Leverage
69	Prem	Exclusive	26-May-16	TSpread Benchmark 2015_58 Large Global Banks by Country		Bank	Technical Leverage
68	Prem	Exclusive	26-May-16	TSpread Benchmark 2015_58 Large Global Banks by Region		Bank	Technical Leverage
67	Prem	Exclusive	26-May-16	TSpread Benchmark 2015_58 Large Global Banks_20160526		Bank	Technical Leverage
66	Prem	Exclusive	26-May-16	TVol Dispersion Ranking Analysis_20160526		Bank	TCO Volatility
65	Prem	Exclusive	26-May-16	Weighted Average TSpread for Sample Banks by Country_20160526		Bank	Benchmarking
64	Prem	Exclusive	26-May-16	Weighted Average TSpread for Sample Banks by Region_20160526		Bank	Benchmarking
63	Prem	Exclusive	26-May-16	Weighted Average TSpread for Sample Banks_20160526		Bank	Benchmarking
62	Open	Report	25-May-16	16.0101OBA Total Net Revenue_58 Large Banks 2005-2015		Bank	Revenue
61	Open	Report	25-May-16	16.0102OBA Sample Total Net Revenue by Region		Bank	Revenue
60	Open	Report	25-May-16	16.0103OBA Model Total Net Headcount_58 Banks_		Bank	Headcount
59	Open	Report	25-May-16	16.0104OBA Bank Model Headcount by Region		Bank	Headcount
58	Open	Report	25-May-16	16.0105OBA Model Hardware Software Spending (58 Banks)		Bank	TCO Components
57	Open	Report	25-May-16	16.0105OBA Hardware Software Tech Spending per Employee_58 Banks		Bank	TCO Components
56	Open	Report	25-May-16	16.0106OBA Sample NHC Technology Spending by Region		Bank	TCO Components
55	Open	Report	25-May-16	16.0107OBA Components of Enterprise TCO Framework Diagram		General	TCO Components
54	Open	Report	25-May-16	16.0108OBA Countries in 2005-2015 Banking Group Sample		Bank	Model Library
53	Open	Report	25-May-16	16.0109OBA List and Key Attributes Sample Banking Groups		Bank	Model Library
52	Open	Report	25-May-16	16.0110OBA Key Metrics - Banking Group Sample (58)		Bank	Key Metrics
51	Open	Report	25-May-16	16.0111OBA Hardware and Software Tech Spending per Employee		Bank	TCO Components
50	Open	Report	25-May-16	16.0112OBA Software v Hardware Spend - Canadian Bank Asset Analysis		Bank	TCO Components
49	Open	Report	25-May-16	16.0113OBA Estimating Software Spend Allocation for TCO		Bank	Software
48	Open	Report	25-May-16	Average Software Implied Hardware Allocation_58 Large Banks		Bank	Benchmark
47	Open	Report	25-May-16	Operations Headcount_Business Segment_Large European Bank		Bank	Headcount
46	Prem	Exclusive	25-May-16	Average Software Implied Hardware Allocation_58 Large Banks		Bank	Hardware
45	Prem	Exclusive	25-May-16	Components of Enterprise TCO Framework Diagram_20160525		General	Information
44	Prem	Exclusive	25-May-16	Countries in Banking Group Sample_20160525		Bank	Information
43	Prem	Exclusive	25-May-16	DB Business Segment RPE (2010-2014) v2	Deutsche Bank AG	Bank	Revenue
42	Prem	Exclusive	25-May-16	DB Technology Expense Analysis (2005-2014) v2	Deutsche Bank AG	Bank	TCO Components
41	Prem	Exclusive	25-May-16	Estimating Software Spend Allocation for TCO_20160525		Bank	TCO Components
40	Prem	Exclusive	25-May-16	Foreshadowing TSpread Benchmarking 58 Global Banks_20160525		Bank	Benchmarking
39	Prem	Exclusive	25-May-16	Hardware Software Tech Spending per Employee_58 Banks_20160525		Bank	Benchmarking

Exhibit 21: Open and Premium Exhibits Bibliography – Exhibits 1-38

#	Library	Link	P-Date	Exhibit Title	Company	Profile	Theme
38	Prem	Exclusive	25-May-16	HSBC Software Assets 2005-2014	HSBC Holdings plc	Bank	TCO Components
37	Prem	Exclusive	25-May-16	Key Metrics - Composite Bank Model (58 Banks) v6		Bank	Banks
36	Prem	Exclusive	25-May-16	List_Key Attributes Sample Banking Groups_20160525		Bank	Banks
35	Prem	Exclusive	25-May-16	Operations Headcount_Business Segment_Large European Bank		Bank	Headcount
34	Prem	Exclusive	25-May-16	Software v Hardware Spend_Canadian Bank Asset Analysis_20160525		Bank	TCO Components
33	Prem	Exclusive	25-May-16	Software v Hardware Spend_US Custodian Bank Capex_20160525		Bank	TCO Components
32	Prem	Report	25-May-16	Visualizing the TGreeks Operational Analytics Framework_20160525		General	Benchmarking
31	Open	Feed	16-Mar-16	Deutsche Bank_Comparison YoY Software / Hardware Spend 2015	Deutsche Bank AG	Bank	TCO Components
30	Open	Feed	16-Mar-16	16.00006OBA Deutsche Bank_Total and NHC Tech Spending 2015	Deutsche Bank AG	Bank	TCO Components
29	Open	Feed	16-Mar-16	16.00007OBA Deutsche Bank_Quarterly FTE Headcount	Deutsche Bank AG	Bank	Headcount
28	Open	Feed	16-Mar-16	16.00009OBA Deutsche Bank_Quarterly NHC Tech Spending 2015	Deutsche Bank AG	Bank	TCO Components
27	Open	Feed	16-Mar-16	16.00008OBA Deutsche Bank_Segment Headcount Growth Indices 2015	Deutsche Bank AG	Bank	Headcount
26	Open	Feed	2-Mar-16	16.00004OBA Deutsche Bank Headcount Segmentation by Division	Deutsche Bank AG	Bank	Headcount
25	Open	Feed	2-Mar-16	Deutsche Bank_Comparison YoY Software and Hardware Spend	Deutsche Bank AG	Bank	TCO Components
24	Open	Feed	11-Feb-16	16.00001OBA Large APAC Bank Tech Asset Analysis		Bank	TCO Components
23	Open	Feed, Rep	11-Feb-16	16.00002OBA Software v Hardware Spend_US Custodian Bank Capex		Bank	TCO Components
22	Open	Feed	6-Dec-15	15.0122OBA Contextual Expansion_Banks FANGs Apple Exxon		Bank	Benchmark
21	Open	Feed	24-Nov-15	15.0121OBA Banks vs. Digital Frontier RPE Benchmark		Bank	Benchmark
20	Open	Feed	19-Nov-15	15.0120O TCO Component Correlation Matrix		Bank	TCO Components
19	Open	Feed	12-Nov-15	15.0119OBA RPE Benchmark w Google Virtu		Bank	Benchmark
18	Open	Feed	12-Nov-15	15.0114OBA Technology per Employee Dispersion Benchmarking		Bank	T-VOL
17	Open	Feed	11-Nov-15	Clues to Shifting in Purchased vs Internally Generated Software		Bank	Software
16	Open	Feed	10-Nov-15	15.0117ODM Data Workflow Ecosystem		Functional	Data Management
15	Open	Feed	2-Nov-15	15.0116OBA Clues to Shifting in Hardware Software Spending		Bank	TCO Components
14	Open	Feed	27-Oct-15	TPE Analytics_Finetuning Sales and Other Engagement Strategies		General	Sales Strategy
13	Prem	Exclusive	27-Oct-15	TVOL_Engagement Strategy Quadrants_20151027		General	TCO Volatility
12	Open	Feed, Rep	22-Oct-15	15.00001OBA Members of Alphacution Composite Model (Sep 2015)		Bank	Model Library
11	Open	Feed	22-Oct-15	15.0113O Illustrative Value of Latency Categories		Functional	Latency
10	Open	Feed	22-Oct-15	15.0111O Latency Categories by Time Range		Functional	Latency
9	Open	Feed	22-Oct-15	15.0112O Revenue per Employee Comparison_51 Banks		Bank	Revenue
8	Open	Report	19-Oct-15	15.0005OBA Weighted Average RPE		Bank	Revenue
7	Open	Report	19-Oct-15	15.00022OBA Sample Total Headcount		Bank	Headcount
6	Open	Report	19-Oct-15	15.0001OBA Sample Total Net Revenue		Bank	Revenue
5	Open	Orphan	19-Oct-15	15.0009OBA Ratio of Technology Spending to Total Net Revenues		Bank	TCO Analysis
4	Open	Report	19-Oct-15	15.00051OBA Weighted Average RPE		Bank	RPE
3	Open	Report	19-Oct-15	15.0003OBA Sample Weighted Average NHC-TPE		Bank	TCO Components
2	Open	Report	19-Oct-15	15.0003.1OBA Sample NHC Tech Spend		Bank	TCO Components
1	Open	Report	19-Oct-15	15.0002OBA Sample Total Headcount		Bank	Headcount

Glossary of Terms

Term	Description
TCO	Total Cost of Ownership - In the context of Alphacution's research, TCO refers to the total cost of a technology solution or solutions, including the aggregate cost of hardware, software and IT-designated human capital
eTCO	TCO for an entire enterprise
RPE	Revenue per employee
TPE	TCO per employee
T-Greeks™	Collection of Alphacution's trademarked analytics related to technology spending and TCO benchmarks
T-Spread™	Represents the difference between revenue per employee (RPE) and total technology spending (TCO) per employee (TPE) for an entire enterprise or discrete business segment over a specific period of time (which, in the current modeling, is typically a unit of 1 year) and where technology TCO includes hardware, software, data and IT human capital
T-Beta™	Represents the linear regression equation – much like a “best fit trend line” – used to create a reference benchmark for a collection of T-Spread™ measurements, typically among similar entities, such as large banks or large asset managers
T-Alpha™	Also sometimes known as “tech dividend,” this analytic represents a condition where the difference between the T-Spread™ (for an Enterprise X) and T-Beta™ (at a point on the benchmark with the same scale as Enterprise X, where scale is defined as total net revenue) is positive
T-Theta™	Also sometimes known as “tech debt,” this analytic represents a condition where the difference between the T-Spread™ (for an Enterprise X) and T-Beta™ (at a point on the benchmark with the same scale as Enterprise X, where scale is defined as total net revenue) is negative
T-VOL™	The “volatility” – as measured by standard deviation – of total technology spending (TCO) per full-time equivalent (FTE) - otherwise known as TPE – for an entire enterprise or discrete business segment over a range of time that is typically several years or several periods
AuM	Assets under Management
AuA	Assets under Administration
AuC	Assets under Custody
AuX	Asset under "X", where X is the nature of a fiduciary relationship such as management, administration or custody



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