ALPHACUTION
RESEARCH CONSERVATORY

# Quantifying the Transformation:

## Benchmarking Enterprise TCO for Global Banks

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# 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 for the financial services ecosystem. Founded by Paul Rowady, Alphacution is specifically designed with a dual mission: 1) To deliver data-driven intelligence and uncommon perspective for data, analytics and technology narratives related to the financial services industry, and 2) to 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 technology total cost of ownership (TCO), operational analytics, business transformation and market sizing, including its T-Greeks™ Operational Analytics Framework for techno-operational benchmarking intelligence. More information can found at www.alphacution.com. Please send inquiries to info@alphacution.com and follow @alphacution.

## Author - Paul Rowady

Paul Rowady is the Founder and Director of Research for Alphacution Research Conservatory, a company originally established in 2004 to develop high-end, visually-intensive trading and research systems. Prior to this, Paul spent 7 years with capital markets consultancy, TABB Group, where he was most notably the founding principal of its technology, analytics and data advisory practice. In total, Paul has 27 years of senior-level research, technology, capital markets and proprietary trading experience with firms like O'Connor & Associates, Quantlab, and Ritchie Capital Management; and has 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 capital markets, data and technology 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 areas like digital transformation, big data analytics, high performance computing (HPC) technologies, total cost of ownership (TCO) benchmarking, 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 2009.

 

# Introduction

*"When the winds of change blow,*
*Some people build walls*
*And others build windmills." ~Chinese Proverb*

As the violent storm of the global financial crisis (GFC) slowly fades further into the rearview mirror, the financial services industry (FSI) has pivoted into a new era that requires a major re-think on operating processes and business models. Talk of *transformation* pervades the air as this industry moves further into the second major generation of modern global markets, now more broadly known as the *Digital Era*. This era is punctuated by a much faster – if not, *radically* different – pace of change. In fact, Alphacution believes that the concepts behind *digital* and *radical* are synonymous.

Clearly, regulatory drivers have proven the most catalytic for banks in the immediate aftermath of this storm. However, there is now growing evidence for the convergence of regulatory drivers with other powerful drivers – including dramatic FinTech innovations and the persistent disorientation of new global economic realities - that augment the urgency to *prepare* for a much greater pace of change. Symbolic of this preparation is the current fascination with digital-era tools, technologies and solutions that represent a more radical pace of change – more accurately known as *operational agility*.

In other words, there is now a growing *acceptance* that disruption is here to stay. And with that acceptance comes the overwhelming sense that a fixation with the topic of transformation must quickly morph into *actual* transformation. Alphacution recommends that all market participants commit to balancing their level of operational agility with their expectation for persistent and disruptive levels of change to their specific mix of businesses and workflows. This balancing act is the transformation piece. However, in order to embark on this type of exercise, market participants still need much better analytical tools to measure, manage and monitor an increasingly fluid configuration of technical and human factors that contribute to operational agility.

In line with this need, Alphacution has developed a new way to understand the relationship between agility and *radical* levels of change: Market participants – particularly the largest global banks (and other complex organizations) who are the largest buyers of technology in the ecosystem – need to persistently strive to "*widen the spread*" between their performance and the component costs to produce that performance. Conceptually, this means having actionable intelligence around operational analytics that illuminate the nature of enterprise performance like never before. Alphacution is cultivating such analytics to help firms better navigate their own transformation. In practice, the spread we are referring to here is the difference between revenue per employee (RPE) – otherwise known herein as "the performance" – and total cost of ownership, or TCO, of technology per employee (TPE) – which is otherwise known here as the "cost of performance."

 

This research aims to detail a standardized analytical framework including ongoing benchmarking of technology spending patterns among key market participants – and thereby improves the precision with which strategic recommendations can be made for the road ahead. More specifically, this research aims to "quantify the transformation" by showcasing such technology spending patterns from several different perspectives including from framework components to region and country to workflow categories.

***Shifting Trend**: A primary component of business transformation is converting commoditized functionality from proprietary to managed services.*

To foreshadow, we know in advance that part of our diagnosis for effective business transformation will be to convert democratized and commoditized functionality to managed services and other partnering arrangements. One question that remains unanswered, however, is how urgently such conversion needs to take place. By the clunking sound of early 2016 earnings announcements among key banking groups, that urgency is growing quickly.

With these introductory comments as a backdrop, the goals of this study are as follows:

- Chapter I – Global Financial Landscape: Outline key drivers of the current global financial services landscape and illustrate how quantifying technology spending patterns clearly reveals the impacts of these drivers;
- Chapter II - Background for Standardized TCO Framework: Showcase Alphacution's framework, methodology, data sample, and composite modeling for measuring TCO – which, for the current analysis, is focused on enterprise TCO for large global banks;
- Chapter III - Analytical Foundation: Present step-by-step details for the process of estimating total hardware, software and IT human capital components of TCO, including a global enterprise TCO estimate for banks;
- Chapter IV – Benchmarks Construction: Feature select Alphacution composite model output from key perspectives, including observations by framework components, by region and country, by workflow categories (or roles), and by firm type or business segment;
- Chapter V - Tactical Transformation: Demonstrate how TCO analytics and benchmarks are useful for measuring, monitoring and managing enterprise and business segment transformation, how process replacement is a more potent form of achieving incremental agility relative to process reengineering, and how a focus on the adoption of managed services or IaaS offerings is a core tactic for process replacement, business transformation and activating higher levels of operational agility; and,
- Chapter VI – Conclusion: Summarize the most impactful findings from the study; introduce the first of Alphacution's T-Greeks™ operational analytics - the T-Spread™; and finally, to foreshadow the utility of additional analytics and broader TCO modeling.

 

## Introduction - Key Points

- The digital revolution in financial services is due to much more than regulatory drivers. Radical disruption made possible with dramatic technical innovations coupled with unprecedented economic uncertainty converges in the current period to upend the competitive landscape.
- The technical capabilities of large and diversified incumbents are generally too slow, expensive, brittle and human capital intensive to respond effectively in the new competitive landscape.
- Given this landscape, all market participants need to engage in ongoing business transformation to achieve higher levels of operational agility so that they can become more responsive to the demand for more targeted customer offerings and ever-fleeting market opportunities.
- Alphacution has developed an operational analytics framework initially based on enterprise technology spending patterns for market participants to more effectively influence their own transformation, and for observers to more accurately monitor and compare trends.
- This report is designed to detail Alphacution's modeling methodologies, showcase framework analytics and other output (based on a sample of 58 global banking groups), and highlight tactical and strategic recommendations for large and complex market participants.

 

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# Chapter I - Global Financial Landscape

*The primary goals of this chapter are to 1) outline the primary drivers of the current global financial services landscape and 2) illustrate how quantifying technology spending patterns clearly reveals the impacts of these drivers.*

*Efficiency…*
*Operational Alpha…*
*More-for-Less…*
*Agility…*

These terms are representative of the foremost priorities for a still-emerging era in global financial services. All of us are competing on the basis of how our firms navigate the unpredictable undulations of an increasingly challenging landscape. Adding insult to injury, the greater the scale of an enterprise the greater the challenges involved in business transformation are likely to be.

**Digital and Analog: Convergence of Drivers**

Now, frankly, there is nothing particularly new in these introductory statements. Facts: The future is always uncertain, and incremental change is always necessary. The hallmark of this new era, however, is the *rate of change*. Exponential advancements in tools, technologies and processes – largely on the back of mass interconnectivity, increasingly pervasive standards, and insanely higher-performance components – offer market participants the potential to perform at levels of speed, operational efficiency and technical leverage that are *radically* enhanced from the prior era.

Let's be clear: *Radical* is the critically operative word here. The potential for *radical* change is truly what it means to be digital. Startups have the luxury of adopting radical innovations because they step onto the playing field with no baggage and an entirely open surface. Renovation is at least an order of magnitude more complex than building anew, as they say.

Meanwhile – back on the other side of the proverbial bridge – large-scale enterprises born in the analog era, mainly dream of fostering much greater levels of agility. Radical adoption of the latest FinTech innovations for radical change is *far* more complicated for large, fragmented and still-siloed incumbents. These players are consistently bogged down with challenges that range from staff churn and other key personnel discontinuities, legacy as well as undepreciated infrastructure, and a complex mix of purchased and proprietary solutions – just to name a few. Layer on top of this dynamics that are unique to large FSI incumbents and the reality of the challenge escalates: A long and consistent streak of (pre-GFC) profitability, growth and low disruption perpetuated cultural complacency and a spectrum of other low-defense, higher-risk business practices. While the party was raging, no one dared call for agility. And now, the threatening light of austerity at the end of this tunnel only augments entrenchment and political inertia.

The post-GFC regulatory juggernaut proved the most catalytic in prying the last of FSI's analog-era finger tips from its age of exuberance. This is well worn history for students of the markets by now, as the unprecedented tsunami of new regulatory structures is now washing over Europe on its way to completing its round trip in APAC and leaving no jurisdiction on the planet untouched. Over the past two years, the FinTech revolution coupled with persistent if not surreal economic uncertainty (typified in part by zero- and negative- interest rate policies) have converged with the aforementioned regulatory juggernaut to create the triumvirate of market mega-drivers we are all wrestling with today.

***Shifting Trend**: Regulation + FinTech disruption+ economic uncertainty = current financial services environment.*

With this bizarre landscape as our backdrop, large incumbents must now identify tools and methods to reconcile the gap between incremental change and radical, digital-age agility; a significant hurdle that is gathering more and more attention from the largest FSI incumbents. Alphacution believes that new tools – including a framework for new operational analytics - are required to help bridge the gap between the current and prior eras; a framework that helps quantify all phases of ongoing transformation, from measurement to management to monitoring – and from solution-specific to enterprise-wide interests. These tools need to be useful in the decision-making process for both tactical and strategic technology migrations. Lastly, we believe that such a framework is useful to demonstrate how the industry's level of urgency for engaging in transformation needs to be stoked. The following are a few high-level samples of that output, using analytics from our revenue, headcount, and technology modeling:

***Question:** What new driver can we expect to add to this equation by 2020?*

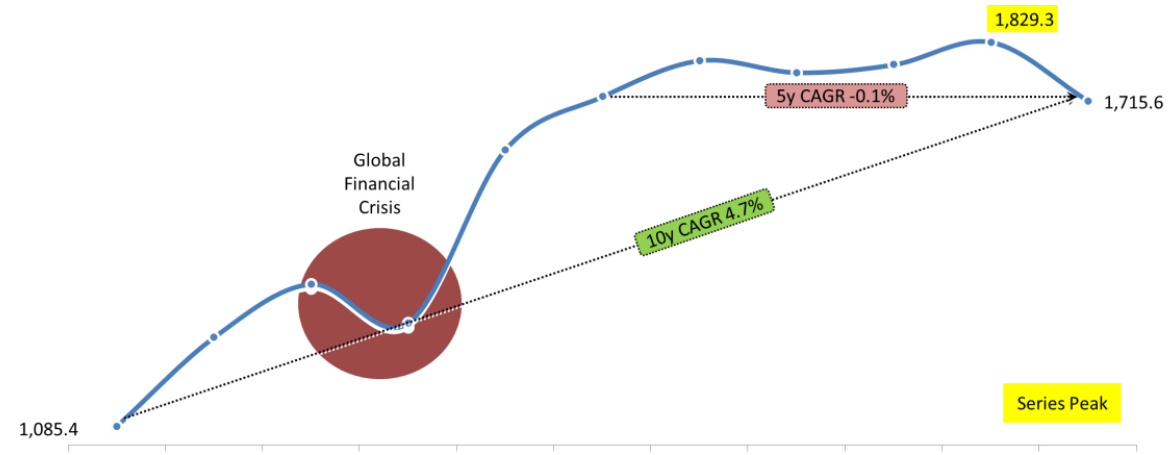
**State of Urgency**

If the concept and urgency of "unprecedented transformation" has been lost on you or your firm, Alphacution's latest round of industry modeling might just provide the clue that our collective hair is in fact on fire. The state of post-GFC complacency has now tipped to an outright state of urgency.

Let's start here: Exhibit 1 (next page) illustrates the aggregate total net revenue of the 58 banking groups included in the latest version of the Alphacution Composite Model (the "Model"). With the exception of the GFC-related drawdown in 2008, this revenue proxy for the global banking sector did not peak until 2014. However, as of the end of 2015, revenue is down on a year-over-year basis more than in *any* other period in the 11-year sample. Much more importantly, the pervasiveness of the drawdown is greater by a factor of more than 30% of the next nearest reading, according to the "up-down" indicator. In other words, in 2015, 41 out of 58 banks yielded year-over-year declines in net revenue. The next nearest reading in 2013 was 30 out of 58. One might conclude from this that fundamentals in the environment are deteriorating.

**Exhibit 1: Sample Total Net Revenue (2005-2015, USD billions)**

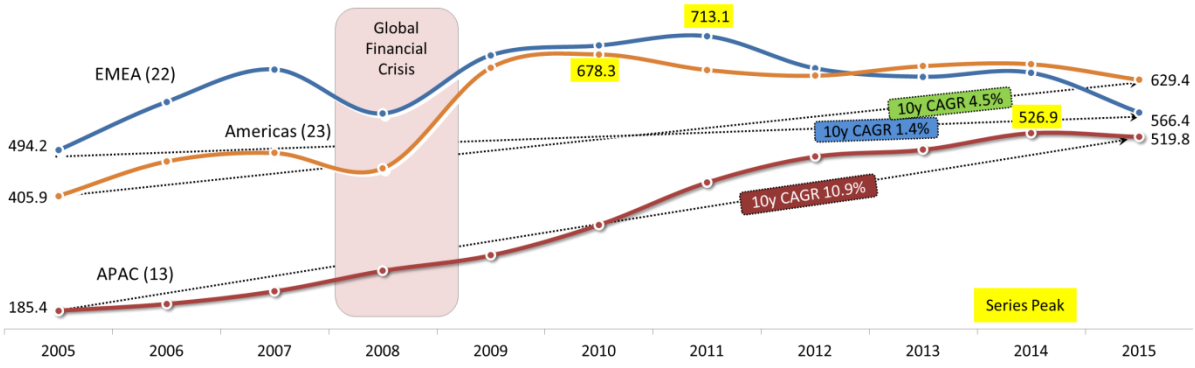



| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Revs – YoY Change | | 172.4 | 103.0 | (74.9) | 335.2 | 102.8 | 69.7 | (23.1) | 15.3 | 43.5 | (113.7) |
| Revs up (# banks) | | 51 | 43 | 38 | 43 | 40 | 44 | 30 | 28 | 36 | 17 |
| Revs down (# banks) | | 7 | 15 | 20 | 15 | 18 | 14 | 28 | 30 | 22 | 41 |

*Source: Alphacution, Company Data*

If we dig a bit deeper for a regional analysis, the variance in net revenue results among the 3 primary regions is notable (see Exhibit 2, below). EMEA has suffered most, down 5.6% since peaking in 2011 (with German, French and Spanish banks peaking that year). In comparison, the Americas have been hovering in place since the GFC, having been largely flat since peaking in 2010. And finally, bucking the Western trend, APAC has demonstrated consistent growth – largely on the back of Chinese banks – for the full duration of the 11-year sample, with the notable exception of 2015 vs. 2014. In the last year, APAC banking revenue is down 1.4% (signaling that FSI is experiencing its broadest challenges since – and even including – the 2008-2009 GFC period).

**Exhibit 2: Sample Total Net Revenue by Region (2005-2015, USD billions)**




*Source: Alphacution, Company Data*

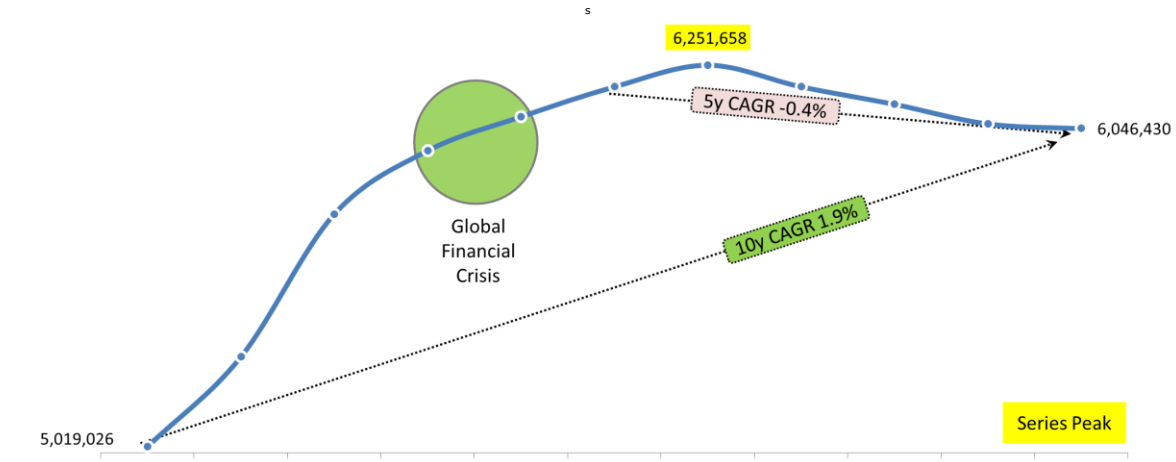
This seems like an amazingly important finding. However, in the spirit of full disclosure, this result could be accentuated by our modeling process. Banks – and most other types of companies – typically restate prior years' financials to accommodate organizational and other types of operational adjustments. Alphacution doesn't do that

in our modeling since it precludes developing a consistent series for longer than 2 or 3 years. Instead, Alphacution takes each year as it is reported and doesn't restate prior years. Nevertheless, this previous illustration does show material headwinds over the past 8 years in the West – and finally, given that this sample of global banks serve as the major source of intermediation in the entire global financial services industry, these results do foreshadow meaningful deterioration in the landscape overall. Score a point for greater urgency in implementing transformation initiatives.

As we turn to an analysis of bank employment (as measured by full-time equivalents – or FTEs), the observations continue to signal a high level of urgency (see Exhibit 3, below). For starters, headcount appears to be a lagging indicator. The fact that total headcount from this sample of large banks did not yield declines in the immediate aftermath of the GFC is noteworthy. And, relative to the fulcrum of the GFC period, total sample headcount did not peak until 2011 – thereby further signaling that headcount is more inelastic than the current landscape, with its needs for greater agility, would appear to need. However, since peaking in 2011, total sample headcount has declined for 4 consecutive years (down an absolute 3.3% since the end of 2011).

**Exhibit 3: Sample Total Headcount (2005-2015, FTEs)**




| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FTEs – YoY Change | | 289,599 | 461,313 | 205,099 | 109,845 | 96,721 | 70,055 | (69,897) | (56,477) | (63,490) | (14,563) |
| FTEs up (# banks) | | 45 | 51 | 39 | 24 | 39 | 33 | 22 | 18 | 24 | 27 |
| FTEs down (# banks) | | 13 | 7 | 19 | 34 | 19 | 25 | 36 | 40 | 34 | 31 |

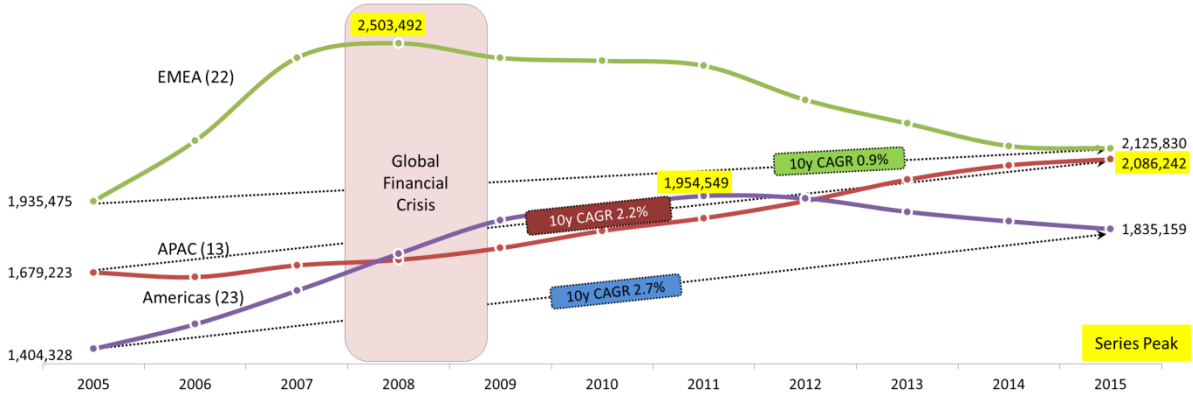
*Source: Alphacution, Company Data*

These high-level observations are in contrast with the specifics at the regional and country levels. Most notably among these is that the greatest number of banking groups (14) yielded peak headcount during 2015 (with 8 banking groups reporting peak headcount in 2014). This is another example of where the data is at odds with the rhetoric, where there is a sense that aggregate headcount is in more significant decline. In any case, this development slowed the pace – and pervasiveness – of headcount declines that saw its peak rate of drawdown (with 40 banking group headcounts in decline) in 2013. In contrast, 2007 yielded only 9 banks with peak headcount (followed by 8 peaks in headcount for 2008).

These results can be explained, in part, by notable regional variance (see Exhibit 4, below). Representing the canary in the coalmine, if there is one, the aggregate EMEA 22 have declined the most since peaking in 2008 (with total aggregate headcount now down an absolute 15.1% since that time). The Americas, on the other hand, did not start to decline until its peak in 2011 (with total aggregate headcount down an absolute 6.1% since the end of 2011). In extreme contrast to the West, however, APAC has grown each year in the sample, heavily influenced by growth in China but supported by strong growth in Japan, Singapore and Australia, as well.

**Exhibit 4: Sample Total Headcount by Region (2005-2015, FTEs)**



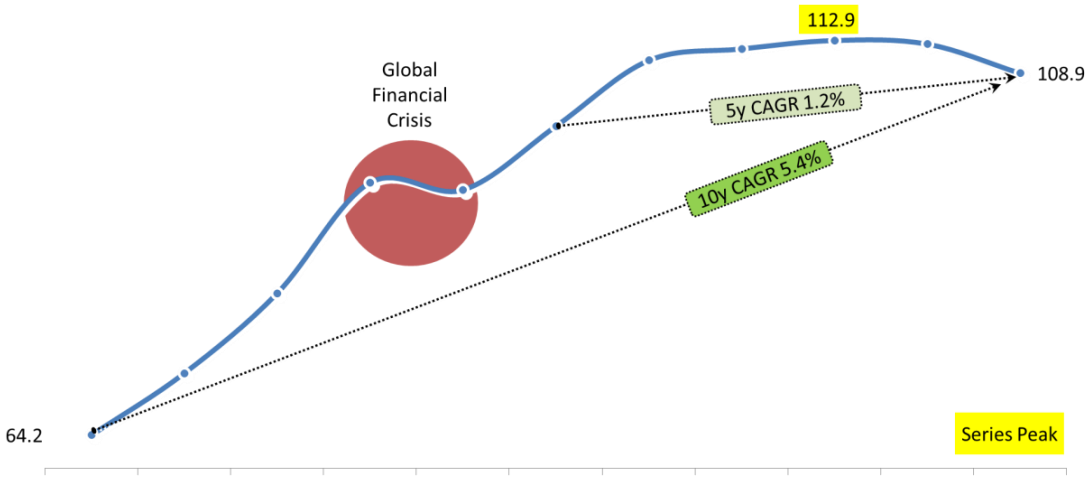

*Source: Alphacution, Company Data*

Finally, we turn to look at hardware and software technology spending patterns (sometimes known herein as non-human capital – or NHC – technology spending). Alphacution estimates that global bank NHC technology spending has yielded a strong 10-year CAGR of 5.4% since 2005 (and a less robust 5-year, post-GFC CAGR of 1.2% since 2010) with a peak in spending in 2013 at US$112.9 billion (see Exhibit 5, next page). From our perspective, this kind of growth is in stark contrast to the prevailing rhetoric that budgets have been under pressure since the GFC. In fact, we will demonstrate later in this analysis that both budget pressure and strong technology spending growth can co-exist (when looking closely at the detailed spending shifts).

Where we see additional evidence for the urgency of transformation argument is in the latest developments from 2014 to 2015, where the year-over-year NHC technology spending decline is greater and more pervasive than in any other 1-year period in the 11-year sample. A decline in tech spending for 2009 is easily explainable. A small decline from 2013 to 2014 (US$ 0.4 billion) could be explained within the margin for calculation error. However, at US$3.6 billion (down 3.2%) across an unprecedented 36 banking groups, these latest results seem to represent a more material – problematic – shift in the ecosystem than we've seen before.

**Exhibit 5: Sample Hardware + Software Tech Spending (2005-2015, USD billions)**




| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NHC Tech – YoY Change | | 7.6 | 9.9 | 13.7 | (0.9) | 7.9 | 8.1 | 1.4 | 1.0 | (0.4) | (3.6) |
| NHC Tech up (# banks) | | 47 | 49 | 52 | 29 | 49 | 50 | 35 | 34 | 33 | 22 |
| NHC Tech down (# banks) | | 11 | 9 | 6 | 29 | 9 | 8 | 23 | 24 | 25 | 36 |

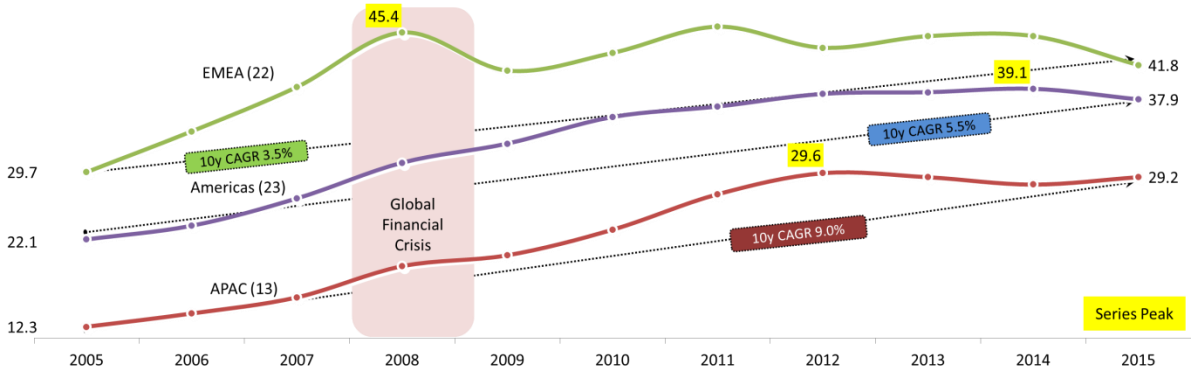
** NHC = Non-Human Capital = Hardware + Software

*Source: Alphacution, Company Data*

Perhaps the regional data can shed some additional light: When observing the regional and country data, it is clear that aggregate spending on hardware and software has stagnated *in all regions*. This stagnation was led by EMEA (peaking in 2008), followed by APAC (peaking in 2012) and then the Americas peaking in 2014. With all that in place – and for now – we will reserve concluding whether this slowdown is a result of slowing demand, switching to more efficient solutions, pricing concessions, or some combination of these.

***Questions:*** *Is your firm seeing a decrease in tech spend? And, if so, is it primarily a result of slower demand, more efficient solutions or lower pricing?*

**Exhibit 6: Sample Hardware + Software Tech Spending by Region (2005-2015, USD billions)**




*Source: Alphacution, Company Data*

**Chapter I - Key Points**

- Regulatory, technical innovation and economic drivers converge to forge an unprecedented competitive landscape that exposes incumbents for their lack of efficiency and agility.
- Large incumbents must now engage in significant transformative initiatives by identifying tools and methods to reconcile the gap between incrementalism and radical, digital-age agility.
- High level output from the Alphacution composite model – based on sample data from 58 large global banks - underscores the level of urgency for market participants to transform to a state of higher operational agility:
    - Total revenue has grown at 10-year CAGR of 4.7% since 2005, but 2015 yielded the first down year in total revenue since the GFC – which was greater (~US$114 billion), more pervasive (41/58 banks) than 2008.
    - On regional basis, total revenue among Americas, EMEA and APAC has become nearly equivalent (given our bank selection); this is due to consistent APAC growth, Americas stagnation, and recent EMEA declines.
    - Total headcount has grown at a 10-year CAGR of 1.9% since 2005, but it peaked in 2011 (~6 million FTEs) and has declined at an average rate of 51,300 per year for 4 years in a row.
    - On a regional basis, total headcount analysis is different for each region: EMEA peaked in 2008 and has been in decline ever since; Americas peaked in 2011 and has been in slower decline (relative to EMEA ever since); and, APAC has been growing consistently since 2006 (peaking in 2015) largely based on headcount growth with Chinese banks.
    - Hardware + software spending has grown at a 10-year CAGR of 5.4% since 2005, however that spending has slowed significantly since 2011 and declined since peaking at ~US$113 billion in 2013. For 2015, hardware and software spending was not only in decline – down US$3.6 billion – but that decline was greater and more pervasive (36/58 banks) than at any other point in the past 10 years, including the GFC.
    - On a regional basis, and similar to headcount patterns, EMEA peaked first among our 3 core regions in 2008 at ~US$45 billion; Americas have been the leading engine of hardware and software spending growth, peaking in 2014 at ~US$39 billion; and APAC has been flat after peaking in 2012 at ~US$30 billion.
- Combining our read of global and regional revenue, headcount, and non-human capital (NHC) technology spending trends, Western markets have been stagnant – if not, declining – since about 2011, with EMEA exhibiting the greatest weakness. The only engine of growth has been APAC (meaning, China) until recently. The urgency for operational transformation has been existent 2011. With China clearly in slowdown mode, that urgency is now actually higher than during the immediate aftermath of the GFC.

# Chapter II – Standardized TCO Framework

*The primary goal of this chapter is to educate around Alphacution's framework, methodology, data sample, and composite modeling for measuring TCO – which, for the current analysis, is focused on Enterprise TCO for large global banks.*

Now that we have revealed a selection of modeling output, let's take a step back to establish the background for our modeling methodology, the enterprise total cost of ownership (TCO) framework, and a few key details on the data sample.

## Methodology

The Alphacution Composite Model (the "Model" or "Sample") is in its initial phase for the FSI ecosystem. In this phase, we harvest financial and operational data from publicly-available sources, such as company annual reports and regulatory filings[1]. This dataset includes primarily annual data from all companies and also selective quarterly data samples from a smaller 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, but continues to expand into other firm types, including brokers, asset managers, pension funds, exchanges, post-trade utilities, technology vendors, and others inside and outside of the financial services arena that add value and context to the ongoing analysis. In total, the Model currently includes financial and operational data from 118 banks, brokers, asset managers, technology vendors, exchanges, and others - most of which over the 11-year period ending December 31, 2015[2]. Furthermore, the companies in the latest version of the Model are headquartered in a total of 24 countries and reporting their financials in 19 currencies. All analytics from which have been converted and normalized to US dollars.

## Enterprise TCO Modeling

In this study, Alphacution sets out to identify and measure the enterprise-level and core components of TCO for the largest global banks. The primary TCO categories include hardware (and related technical infrastructure), software (and other related data processing), IT-related human capital, and third-party data subscriptions. Specifically, the hardware category includes mainly computer equipment, data center infrastructure, networking and connectivity, and telecommunications. The software category includes both internally-generated and purchased (or otherwise acquired) software solutions.

Furthermore, with the exception of third-party data subscriptions, each of these categories has internal (or proprietary) and external (i.e. – outsourced, contracted or managed services) counterparts. And, to complicate the longer term modeling and analysis a little further, managed services, in particular, can be represented by various

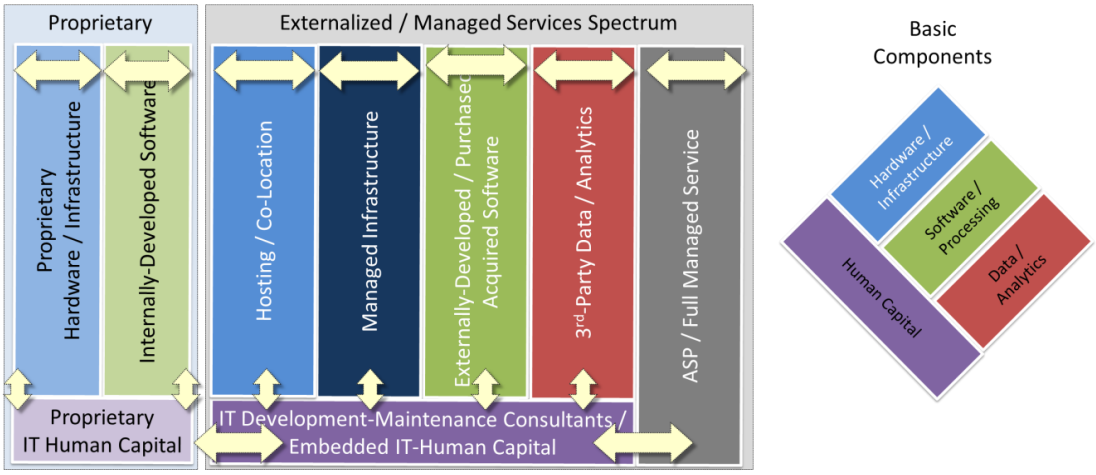
[1] Includes, for example, US SEC's Forms 10-K, 10-Q, and 20-F (which must be submitted by all "foreign private issuers" that have listed equity shares on exchanges in the United States).

[2] Subscribers to Alphacution's Premium Content Library receive access to detailed and exclusive output from individual and composite models.

combinations of the hardware, software and human capital components. For instance, a *fully* managed services solution – such as market data infrastructure – typically involves all TCO categories, including the embedded IT human capital component, baked together. Exhibit 7 showcases the variations between the mix of internal and external TCO components and configurations.

**Exhibit 7: Proprietary / Externalized Components of Comprehensive Enterprise TCO Framework**




*Source: Alphacution*

## Data Sample

For this study, we are focusing on 58 of the largest global banking groups for the period 2005 through 2015. This Sample is specifically chosen to include the top 10 banking groups as ranked by Tier 1 capital (2015), all 30 global systematically important banking groups (G-SIBs), and all 22 primary dealers (2014) – among other key attributes (see Exhibit A1 in the Appendix). Additional highlights are as follows: 23 banking groups headquartered in North and South America (the "Americas"), 22 banking groups headquartered in Europe, Middle East or Africa (EMEA), and 13 banking groups headquartered in the Asia Pacific region (APAC). This Sample is further broken down into their headquartered countries, as follows (see Exhibit 8).

**Exhibit 8: Countries Represented in the Data Sample[3]**

| Region | Country | Banks |
|---|---|---|
| Americas (23) | Brazil | 2 |
| | Canada | 5 |
| | US | 16 |

| Region | Country | Banks |
|---|---|---|
| APAC (13) | Australia | 3 |
| | China | 4 |
| | Japan | 5 |
| | Singapore | 1 |

| Region | Country | Banks |
|---|---|---|
| EMEA (22) | Denmark | 1 |
| | France | 4 |
| | Germany | 2 |
| | Italy | 2 |
| | Netherlands | 3 |
| | Spain | 2 |
| | Sweden | 1 |
| | Switzerland | 2 |
| | UK | 5 |

*Source: Alphacution*

[3] Region, country and other grouping labels are typically followed by a number in parentheses, "EMEA (22)" or "Brazil (2)" or "Global Markets (8)". These figures represent the number of banks within that grouping.

In total, this Sample represents 16 countries operating in 11 currencies. It also employed total aggregate 6.0 million people, generating US$1.7 trillion in net revenue, spending a total aggregate $525.6 billion on compensation and benefits, and also representing an estimated aggregate technology TCO of $168.8 billion (including hardware, software and IT related human capital) for 2015 (see Exhibit 9).

**Exhibit 9: Key Sample Metrics[4]**

| Key Sample Metrics | 2015 | 11-Year Average | 5-Year CAGR (%) | 10-Year CAGR (%) |
|---|---|---|---|---|
| Total Net Revenues[1] | 1,715.6 | 1,566.3 | -0.1% | 6.0% |
| Full-Time Equivalent (FTE) Employees | 6,046,430 | 5,909,640 | -0.4% | 2.1% |
| Total Compensation[1] | 525.6 | 468.8 | 1.1% | 5.2% |
| Average Annual Compensation per FTE | 117.8 | 118.1 | -0.1% | 1.6% |
| Total Cost of Ownership (TCO)[1] | 168.8 | 154.0 | 0.8% | 4.7% |
| Total Software Spend[1] | 48.6 | 35.6 | 5.8% | 8.1% |
| Total Hardware Spend[1] | 60.3 | 61.4 | -1.7% | 7.6% |
| Total IT Human Capital (HC) Spend[1,2] | 59.9 | 57.1 | 0.1% | 3.4% |

1) US$ billions, 2) estimates based, in part, on *weighted-average* annual compensation per FTE

*Source: Alphacution, Company Data*

Also, incredibly important for the following analysis are the 5- and 10-year CAGR rates for software, hardware and IT human capital spending. We will get into considerable detail around these figures in the pages that follow. However, it is worth noting here at the outset that hardware spending – which has heretofore been the largest component of TCO – is gradually losing that leadership position. With that, and on the back of new fully managed services and Infrastructure-as-a-Service (IaaS) offerings, Alphacution is predicting that software spending will end up becoming the largest component of enterprise TCO for banks in the next 3 years (or by the end of 2018).

***Shifting Trend**: Alphacution expects software spending to become the largest component of enterprise TCO in the near term.*

[4] All averages presented in this report are weighted averages, unless otherwise noted.

## Chapter II - Key Points

- The Alphacution Composite Model is an aggregate of individual models, currently totaling 118 diverse financial service companies headquartered in 24 countries and reporting their financials in 19 currencies.
- Data for this model is currently harvested from publicly-available documents, including annual reports and regulatory filings.
- This study focuses on data from 58 of the largest banking groups in the world which are headquartered in 16 countries and reporting financial data in 11 currencies.
- All financial data in the Model is converted and normalized to US dollars.
- The banking groups in this report are comprised of all 2015 G-SIBs (33), all primary dealers as of 2014 (22), all top 10 global banks for 2015 (as measured by Tier I capital), and 50 of the top 100 banking groups for 2015 (as measured by assets).
- In 2015, these 58 banks generated $1.7 trillion in revenue, employed slightly more than 6 million people, and spent US$169 billion on technology including ~US$60 billion on hardware, ~US$60 billion on IT human capital, and ~US$49 billion on software.
- Alphacution predicts that software spending will surpass hardware spending as the largest component of TCO within 3 years (or by the end of 2018).

# Chapter III - Analytical Foundation

*The primary goal of this chapter is to present step-by-step details for the process of estimating total hardware, software and IT human capital components of TCO which then leads to an estimate for global enterprise TCO for banks.*

With our methodology, framework, and data sample in place, the next step in the process is to estimate the top line value of the TCO component categories, namely hardware, software and IT-related human capital[5]. We believe that the easiest part of establishing this analytical foundation – if there is one – is to find the value of the combination of hardware and software – or, non-human capital (NHC) technology spending. The reason for this first step is that it is the closest to how banks disclose their information technology costs.

## Estimating NHC Technology Spending

With very few exceptions, banks do not disclose technology spending in much detail. More specifically – if they do disclose any detail at all – most banks disclose a bundled "information technology" expense line or something similar in the income statement[6]. There are a few standout banks that disclose technology spending in great detail, delineating between categories of hardware, software, development and maintenance expenses – or, who break out detailed software values between internally-generated and purchased sub-categories. There are also banks who disclose no additional detail beyond very broad operating expense categories in the income statement and/or very broad asset values in the balance sheet. Many US banks – including G-SIBs – are notorious for providing very little transparency on their technology spending patterns.

This brings us to two key points: First, due to the variance in the quality, accuracy and detail of individual banking models, Alphacution gives each of them a grade; a semi-objective score based on levels of detail in the income statement, balance sheet, and the notes to each (including financial and operational data for business segmentation). With this method, we can be sensitive to where we rely on strong models vs. reliance on weak models.

The second point is about context – and a discussion that is likely beyond the scope of this report. At the base of this exercise is the reality that the numbers we seek are unknowable. There is no omniscient arbiter of exact technology spending data for a global consortium of complex banking groups. So – like a massive and increasingly complex Sudoku puzzle – we must seek the best and most credible context available in order to properly estimate the values that cannot be directly observed. In short, stronger models will add incremental improvement in context for supporting certain figures and estimates in weaker models – particularly as we seek to look beyond bulky spending categories. Exhibit 10 (next page) is our first illustration for how the analysis in each individual model is normalized and aggregated to generate "per employee"

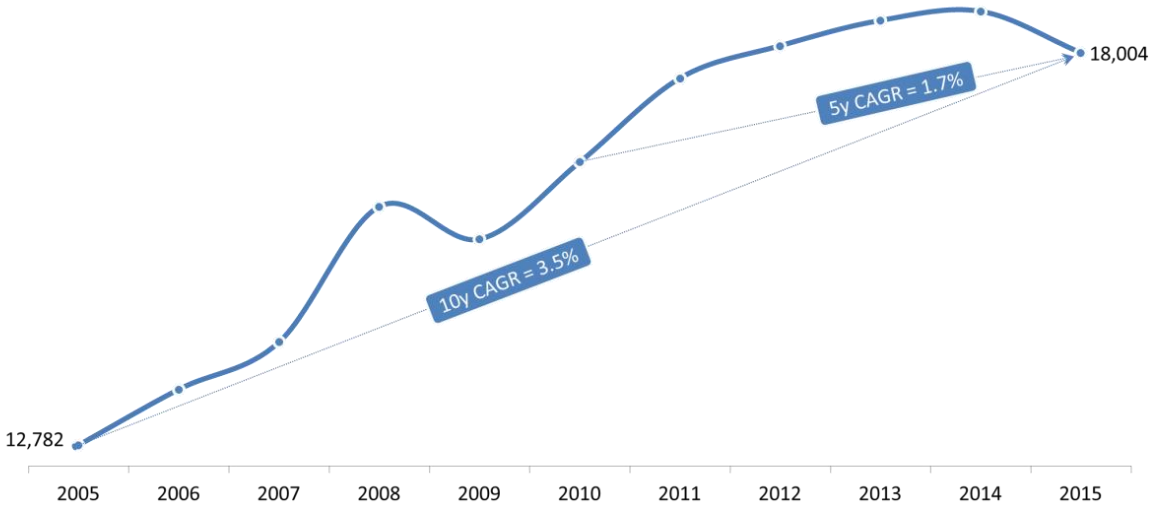
[5] Recall that the value of third-party data subscriptions is not yet estimated separately – and is currently assumed to be embedded with hardware spending estimates.

[6] ...or in the notes to the income statement under detailed operating expenses, general and administrative expenses, or non-personnel operating expenses.

metrics. In this example, we demonstrate that the weighted average spend on hardware and software – otherwise known as non-human capital (NHC) technology spending - in 2015 was US$18,004 per employee (or full-time equivalent, FTE).

**Exhibit 10: Hardware + Software Tech Spending per Employee (2005-2015, USD)**



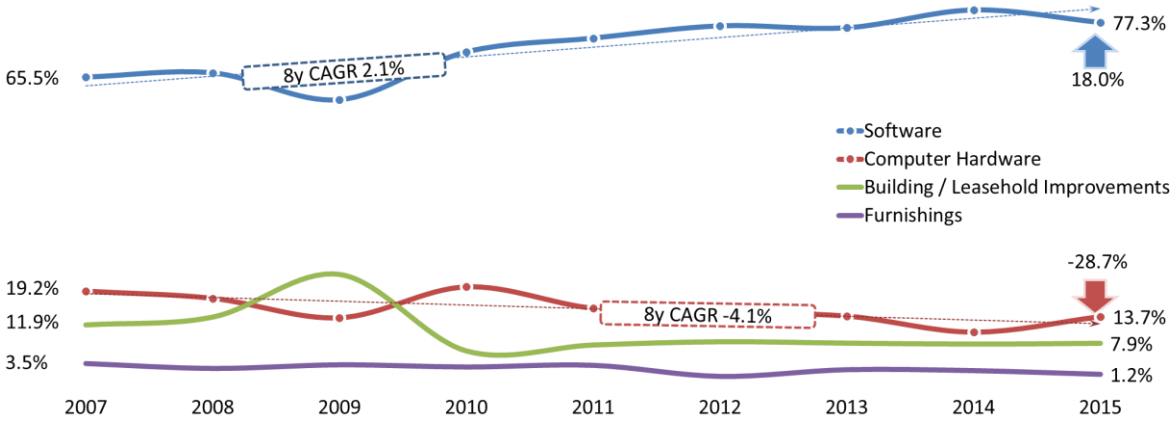

*Source: Alphacution, Company Data*

The next question is how to split the broader NHC technology spending category into its primary categories, hardware and software. For now, we assume that if one of these can be determined with credibility, the other is whatever is left over.

## Estimating Software Spending

It turns out that some of our individual bank models hold clues that we can use to estimate certain figures for the entire group. Exhibit 11 is a perfect example of this: A US-based bank discloses a breakdown of capital expenditures (or "capex") – including for software and hardware - for an 8-year period commencing in 2007.

**Exhibit 11: Software v. Hardware Spend (US Bank–Capex Breakdown, 2007-2015)**




*Source: Alphacution, Company Data*

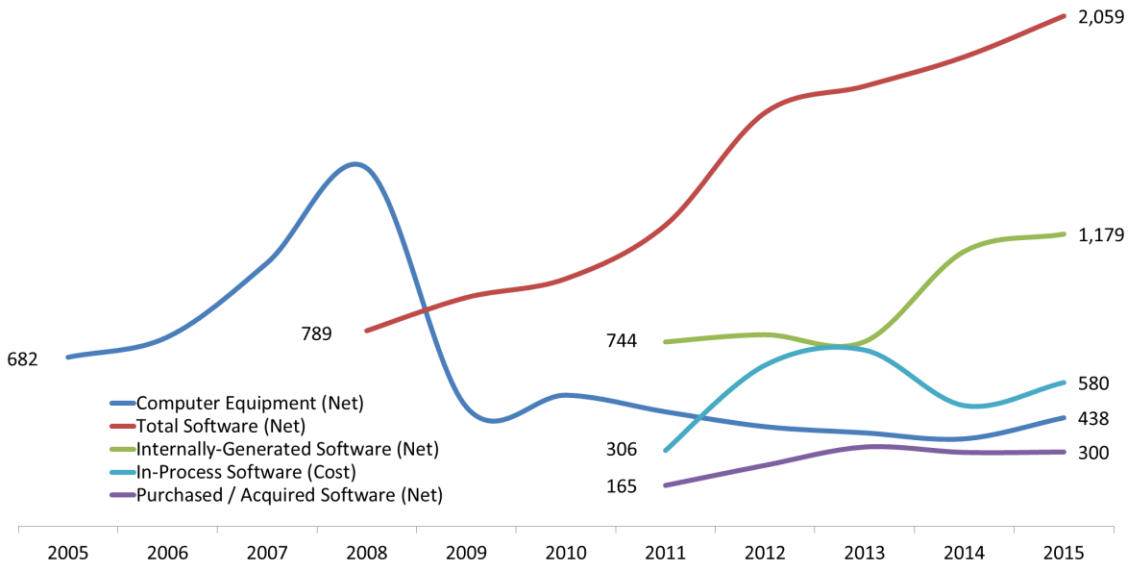
Beware that this chart is an illusion. Both hardware and software spending are increasing on a dollar basis – 8 year CAGR of 2.1% for hardware vs. 9.3% for software.

This is because the overall capex budget is growing at an 8 year CAGR of 7.1%. However, as a portion of capex – and since software is growing so much faster than hardware – software continues to demonstrate the aforementioned crowding out effect on hardware and other capex spending. Another way to measure this relationship: In the previous example, software capex represents a multiple of 3.4 vs. hardware (at the minimum, in 2005) and 7.8 (at the maximum, in 2014). This is an extremely important point because it may explain a new motivating factor behind increasing adoption of more cost-efficient fully managed services or Infrastructure-as-a-Service (IaaS) offerings due to regulation-induced software development needs.

Another great example of spending clues can be found below in Exhibit 12: A large Canadian bank provides increasing balance sheet transparency on computer equipment and software asset values over our 11-year modeling period. These disclosures clearly illustrate shifting resource allocation patterns between and among the primary TCO categories, with further transparency on the relative shifts in internally-generated and purchased software, beginning in 2011.

**Exhibit 12: Software v. Hardware Spend (Canadian Bank Analysis, 2005-15, USD millions)**




*Source: Alphacution, Company Data*

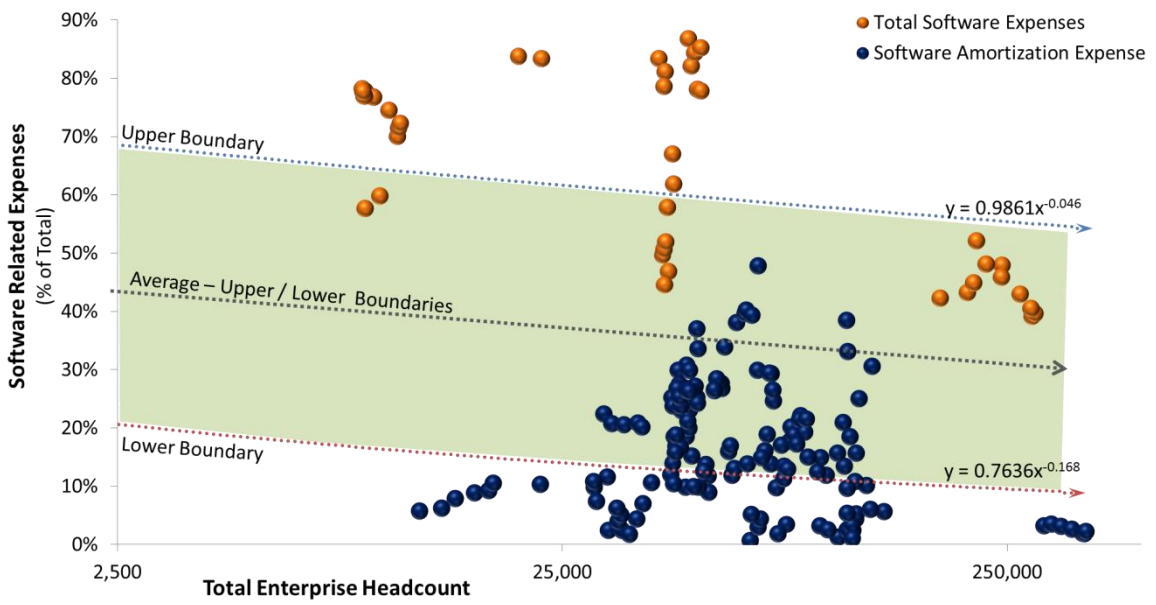
When we take these two examples into account – along with many others - this modeling can begin to offer a credible framework for estimating average software spending patterns for the Sample (and the global banking sector, as a whole). Based on observations from 24 banks representing 13 countries over 11 years (218 total data points), we can develop a scatterplot chart from which to generate best-fit trend lines (see Exhibit 13, next page).

In this example, observations (where n=157) of software amortization expenses form a lower boundary and observations (where n = 61) of total software expenses form an upper boundary. The average of the equations of these upper and lower trend lines form the basis for estimation of average software expenses as a portion of NHC technology spending and also based on enterprise scale (or total headcount.) Notice

that software expenses are skewed based on total headcount, where economies of scale become more prevalent with more employees.

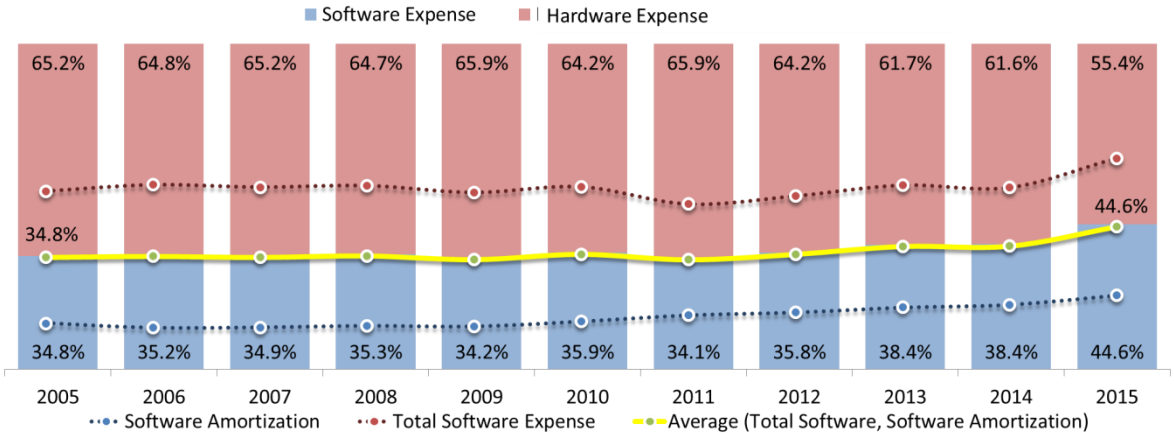
**Exhibit 13: Estimating Software Expense Allocation (2005-2015 Average)**




*Source: Alphacution, Company Data*

One drawback of the presentation format of Exhibit 13 is that it does not reflect changes in software spending patterns over time – which are significant. So, if we were to segment our 218 software expense-related observations by year, we would arrive at Exhibit 14, below. In this case, average software expenses (independent of enterprise scale) increases from 34.8% of total NHC technology spending in 2005 to 44.6% in 2015. These results imply that hardware spending over the same period declines significantly from 65.2% of NHC technology spending in 2005 to 55.4% in 2015 and thereby providing more weight behind the aforementioned software crowding out theory.

**Exhibit 14: Average Software / Implied Hardware Spending (% of Total NHC-TCO)**




*Source: Alphacution, Company Data*

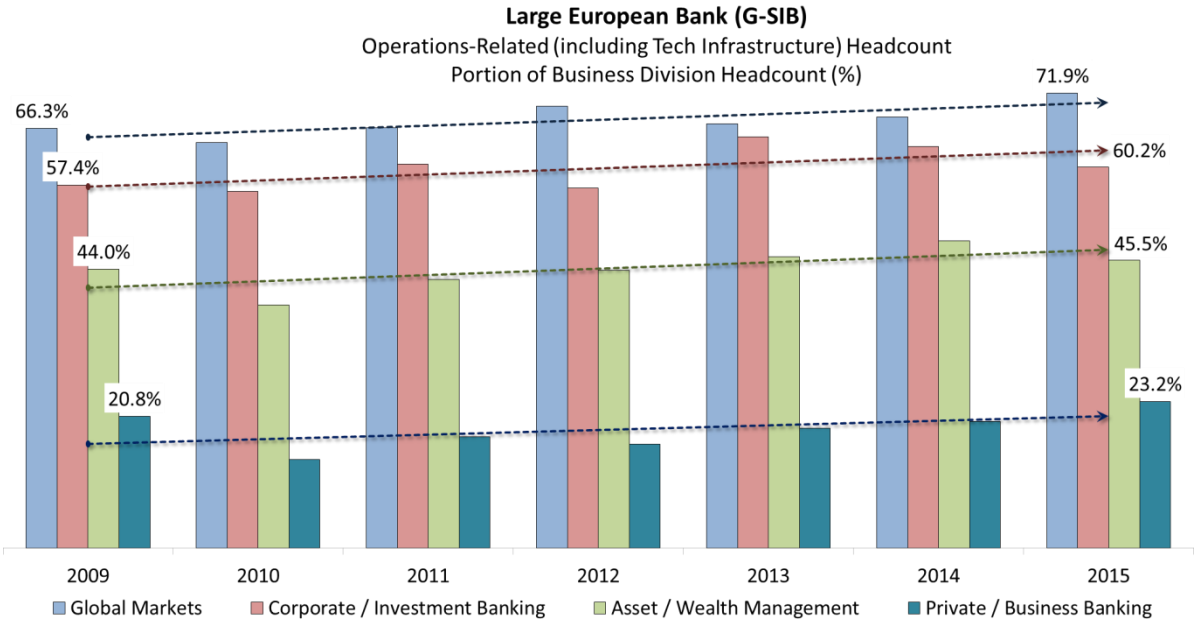
## Estimating IT Human Capital Spending

The last piece of this phase of the puzzle is in estimating the IT-related human capital (IT-HC) component of TCO. The process is similar to the previously illustrated software expense estimation, but arguably a notch more fascinating because of the evidence for how global banks have modified their organizational structures to address the cost of technical redundancies and fragmentation in the post-GFC era – and take a meaningful step towards achieving greater operational agility. Alphacution also believes that these new organizational structures indirectly address "cultural fragmentation" which is a major intangible impediment to achieving agility.

Specifically, a growing number - yet still a minority - of banks (11 of 58 in the Sample) have been setting up organizational segments labeled "corporate center" or some other related business unit that represents the "horizontal", enterprise-wide functions that support all "vertical" segments. This infrastructure-oriented organizational structure is roughly defined as including mostly enterprise functions – which is a very broad spectrum. For example, these new groupings can include the likes of corporate communications, audit, strategy, research, finance, tax, risk, regulatory and compliance, public affairs, human resources and – most notably for our purposes here – technology, operations and digital transformation initiatives responsible for support of the chief information and chief data offices.

In Exhibit 15, we use evidence from one large European bank to illustrate the proportion of operations-related headcount (including technology infrastructure personnel) for each of four core business segments – as well as the change in those proportions since the re-organization exercise was first implemented in 2009.

**Exhibit 15: Estimating IT Human Capital Allocations (European Bank / G-SIB, 2009-15)**



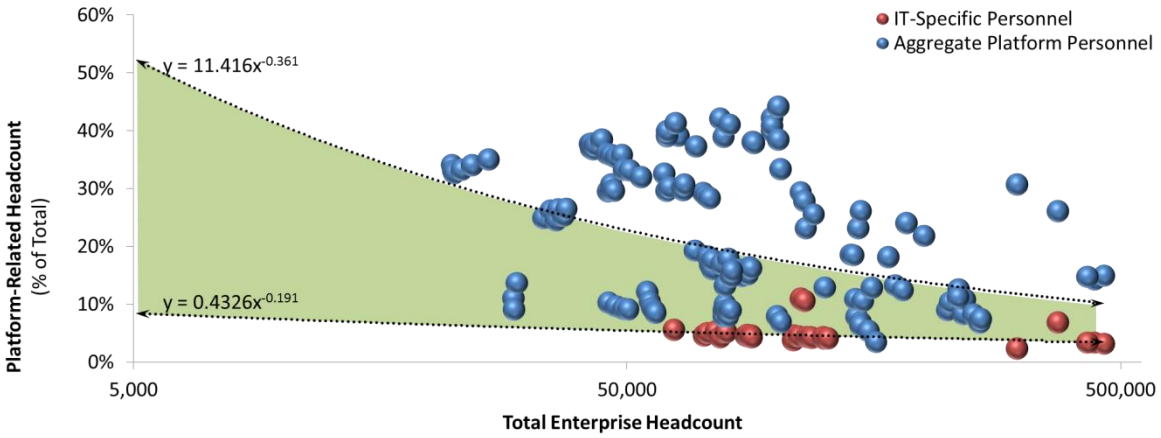

*Source: Alphacution, Company Data*

Note that - in all of these cases - not only has the proportion of corporate center headcount grown as a percentage of total headcount for each business division since 2009, but the variance in the percentage of corporate center headcount by the *nature* of each business division is fascinating, as well. These are incredibly valuable clues for how a diversified financial organization fits together, and the relative proportion of IT-related personnel that are necessary given the activities in different types of financial businesses. Alphacution believes that a simple axiom emerges from this evidence that proves useful in determining each business segment's "technology signature"*: Higher-touch businesses have lower automation, and therefore, lower IT human capital allocations; lower-touch businesses have higher automation, and therefore, higher IT human capital allocations.*

All that said, we used the aforementioned evidence along with disclosures from other banking groups[7] to estimate the IT-HC allocation for the Sample TCO (see Exhibit 16).

**Exhibit 16: Estimating IT Human Capital Allocation for TCO (% Total Headcount, 2005-15)**




*Source: Alphacution, Company Data*

As with the software spending estimation process, each subset of observations (for IT-specific personnel and aggregate "group center" personnel) yields a best fit line, which gives us an upper and lower boundary for estimation. Then, we take the average of the equations from the scatterplot to estimate IT-HC allocations for each bank in the Model according to their scale, or total employees. Recall that these estimates are scale dependent, much like Exhibit 10 illustrates a skew of corporate center headcount where smaller firms need more enterprise operational personnel and larger banks need fewer enterprise operational personnel. Lastly, in order to complete the estimate of IT-HC for our TCO modeling, we combine bank-specific IT personnel estimates with average annual compensation per banking group to arrive at the IT-HC expense estimate.

Finally, when we combine the estimates described above for each of the core spending categories - software, hardware (implied, and the estimates for which currently including third-party data costs, such as market data), and IT human capital costs - we

[7] 22 banks in total, headquartered in 11 countries, representing 162 unique observations over 11 years.

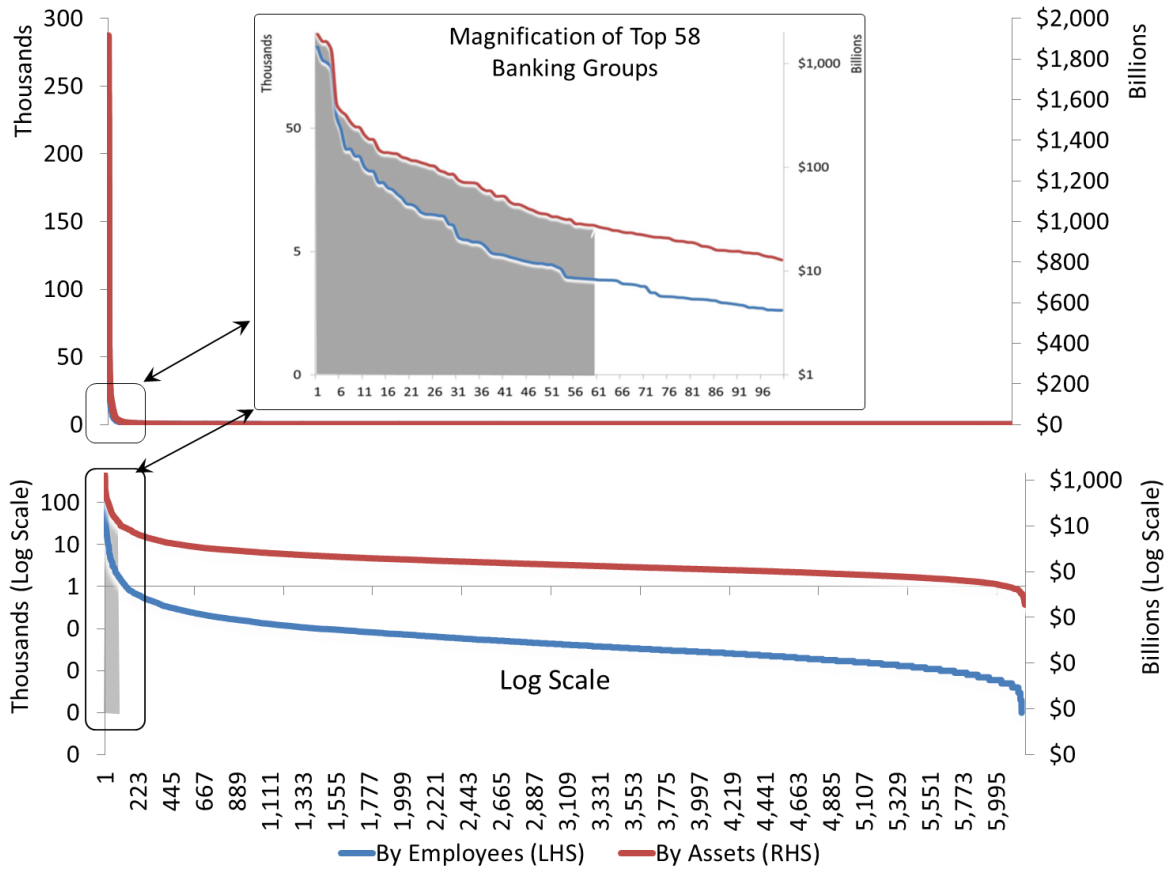
 

arrive at figures that get us one step closer to estimating global enterprise TCO for banks.

## Estimating Global Enterprise TCO

The global banking sector is incredibly concentrated – and this kind of concentration has a very unique "shape". For instance, based on data from USBankLocation.com, 52% - or US$ 8.3 trillion - of banking assets (and 47% of banking employees) are represented by the top 10 US banks. It turns out that the shape of this concentration is also quite useful for estimation for lots of economic phenomena, like TCO. In other words, with so much of the banking activity and employment concentrated literally within the top 1% of the total market, concentration makes the estimation of totals much easier to calculate (see Exhibit 17).

**Exhibit 17: Shape of US Banking Concentration for Global TCO Estimation**



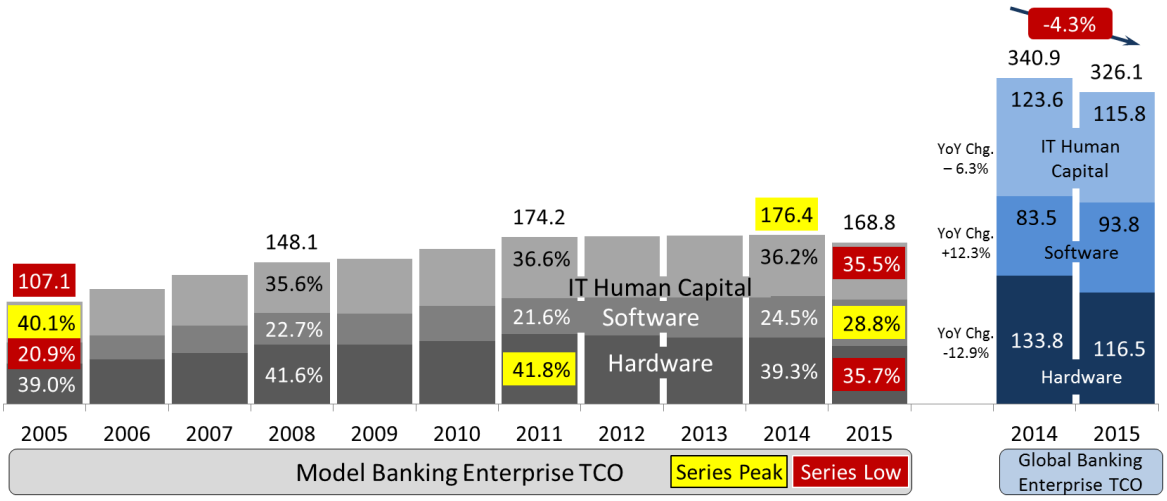

*Source: Alphacution, USBankLocations.com*

From here, all we need to estimate is how much of the total banking sector is represented by the Sample. We arrive at this estimation by calculating that the US segment of our Sample banks represents 51.8% of US banking headcount (for 2015). Assuming that this relationship holds up globally – an assumption worth debating further - we can estimate global banking headcount (11.7 million) and from there we can use our Model estimates for software, hardware and IT human capital *per*

*employee* to finally arrive at a global enterprise TCO estimate of US$326.1 billion for 2015, down 4.3% from 2014 – and where declines in hardware and IT human capital spending does not offset increased software spending (see Exhibit 18, next page).

**Exhibit 18: Model, Global Bank Enterprise TCO by Components (2005-15, USD billions)**




*Source: Alphacution, Company Data*

Furthermore, Alphacution's current estimate for total global enterprise TCO for banks in 2015 includes nearly equivalent hardware and IT human capital spending of US$116 billion each and software spending is estimated to be US$94 billion. Digging a level deeper, software spending is at an 11-year high in 2015 (as a percentage of enterprise TCO) – coming at the expense of both hardware and IT human capital, which currently stand at 35.5% and 35.7% of TCO for the period, respectively - *both 11-year lows*.

***Shifting Trend**: As a portion of total enterprise technology spending by global banks in 2015, Alphacution estimates that hardware and IT-related human capital were both at 11-year lows while software was at an 11-year high.*

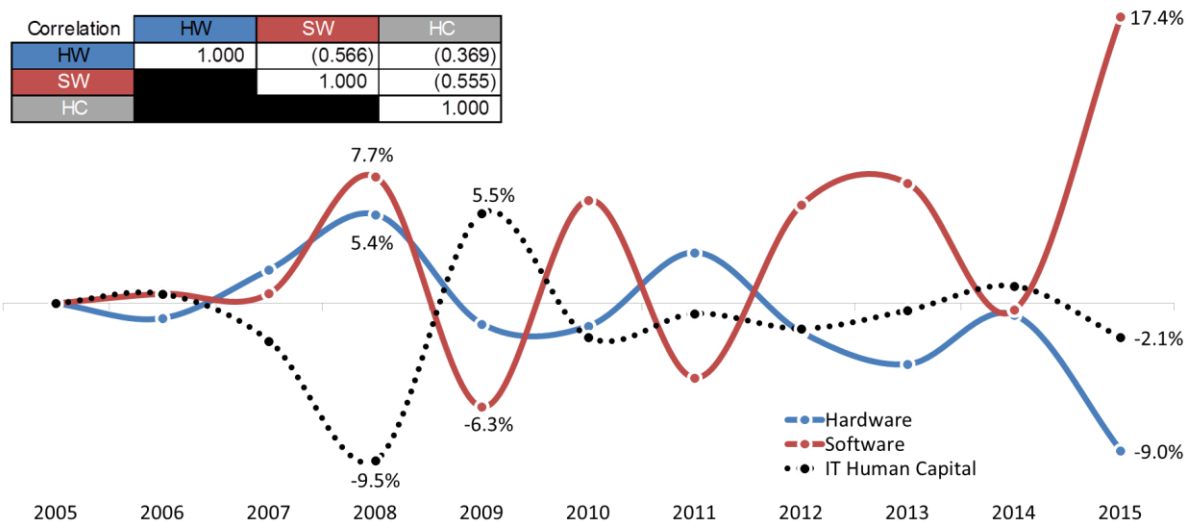
The cause of these extremes fall into a few buckets – namely, new pricing strategies, shifting demands, new solution offerings, and combinations of each of these. For instance, new solution offerings – most notably managed services and IaaS offerings - have the effect of moving the IT human capital expense from a proprietary to an embedded cost of a service or solution. It is this shift in the human capital component – from internal to embedded external – that represents the strongest argument for increased adoption of higher-performance *and* lower TCO managed services solutions (particularly for areas where functionality has become commoditized or democratized).

So, for 2015, an 11-year low in IT human capital spending could be explained, at least in some part, by ongoing elimination of proprietary IT human capital. Exhibits 19A and 19B (next page) illustrate just how dramatic the shifts in component allocations have been, and really only since 2011.

**Exhibit 19A: Annual Change in TCO Component Allocations (2005-2015, % of TCO)**

| Correlation | HW | SW | HC |
|---|---|---|---|
| HW | 1.000 | (0.566) | (0.369) |
| SW | | 1.000 | (0.555) |
| HC | | | 1.000 |




*Source: Alphacution, Company Data*

All three core TCO components exhibit high correlations through the GFC until around 2010-2011. It is almost as if - operationally and structurally - large banks generally experienced a lag of 2 years before any meaningful (net) reaction to the events of the GFC was evident. Arguably, it took at least this long for new regulations to achieve enough clarity on risk reporting, new clearing and collateral rules, and other regulatory transparency initiatives. For instance, the G-20 Commitments on OTC Derivatives Reform began in Pittsburgh USA in September 2009. It wasn't until at least a year later that early preparations for these new rules began.

Since 2010-2011, persistent shifts occurred in all core TCO components: Growth in software spending is the most dramatic. Without 3rd party, off-the-shelf software solutions to manage new enterprise-scale governance, risk and compliance (GRC) mandates, banks poured considerable new money into custom, internally-generated software development projects. Along with this, increasing needs to respond to "digital disruption" from areas like mobile banking and improved user experience (UX) as well as the expensive, agility-preventing effects of redundant and fragmented technologies also boosted demands for software investments. (Note that any embracing of open source solutions, like Hadoop, has not impacted software spending trends yet).

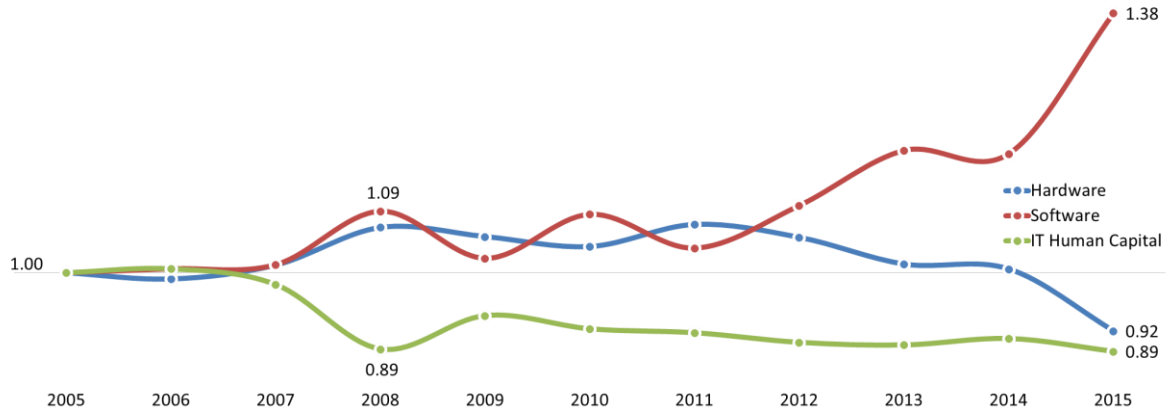
***Question:*** *Are open source and open platform initiatives simplifying and streamlining your technology ecosystem?*

In parallel, and to make room in already tight and inelastic tech budgets (where new software spending essentially began to "crowd out" hardware investments), banks engaged in two primary strategies to contain hardware spending: First, they have stretched the life of legacy infrastructure wherever possible – which is the same as slowing hardware depreciation and refresh cycles. The second strategy is clued in by the gradual decline in IT-human capital allocations: Banks have been gradually eliminating proprietary management of technical infrastructure and discrete processing

functionality – like market data management - in favor of a spectrum of fully managed service and IaaS offerings that allow them to reduce proprietary headcount and either eliminate or embed those costs in the more outsourced offerings. As Marc Andreesen, co-founder of Netscape and more recently venture capital firm Andreessen Horowitz, opined in 2011: "Software is eating the world."

**Exhibit 19B: Cumulative Change in TCO Component Allocations (2005-2015, % of TCO)**




*Source: Alphacution, Company Data*

## Chapter III - Key Points

- There are no standards for disclosing technology related spending, and therefore, there is wide variance in reporting details. Banks rarely report technology spending broken down between hardware, software and IT human capital.
- Alphacution estimates that weighted average spending on hardware and software per employee by global banks in 2015 was ~US$18,000 – representing a 10-year CAGR of 3.5% and a 5-year CAGR of 1.7%
- Since 2011, software spending needs have created a "crowding out" effect on hardware spending; this has caused both extension of legacy hardware lifecycles and the beginning of accelerated adoption of managed services, cloud and other IaaS offerings.
- High demands for custom, internally-generated software has also caused purchases of 3rd party software to be flat to down.
- A minority of banks shifts in organizational structure to include "corporate center" or other horizontal operations segments – for enterprise technology, risk and other horizontal functions – is evidence for select movements towards more agile operating strategies
- Detailed bank segment analysis yields evidence that each type of business segment has a unique "technology signature"; generally this means: Higher-touch businesses have lower automation, and therefore, lower IT human capital allocations; lower-touch businesses have higher automation, and therefore, higher IT human capital allocations.
- This analysis confirms that the estimates for IT human capital are scale dependent; smaller firms need more corporate center personnel and larger firms need fewer corporate center personnel on a proportional basis.
- The global banking sector is incredibly concentrated; the "shape" of this concentration allows us to leverage estimates from 58 large banks into an estimate for Global Bank TCO.
- In 2015, the Sample TCO was $169 billion; software spending achieved an 11-year peak of 28.8% of TCO; both hardware and IT human capital delivered 11-year lows of 35.7% and 35.5% of TCO, respectively; and Global Bank TCO was ~US$326 billion.
- The cause of TCO component spend extremes in 2015 is due to the convergence of drivers (regulatory, digital innovation, and economic uncertainty); additionally, demands for enterprise and digital software initiatives since 2011 have had a "crowding out" effect on hardware and IT personnel spending, which has further caused a tipping point for adoption of fully managed services and IaaS offerings.

# Chapter IV - Benchmark Construction

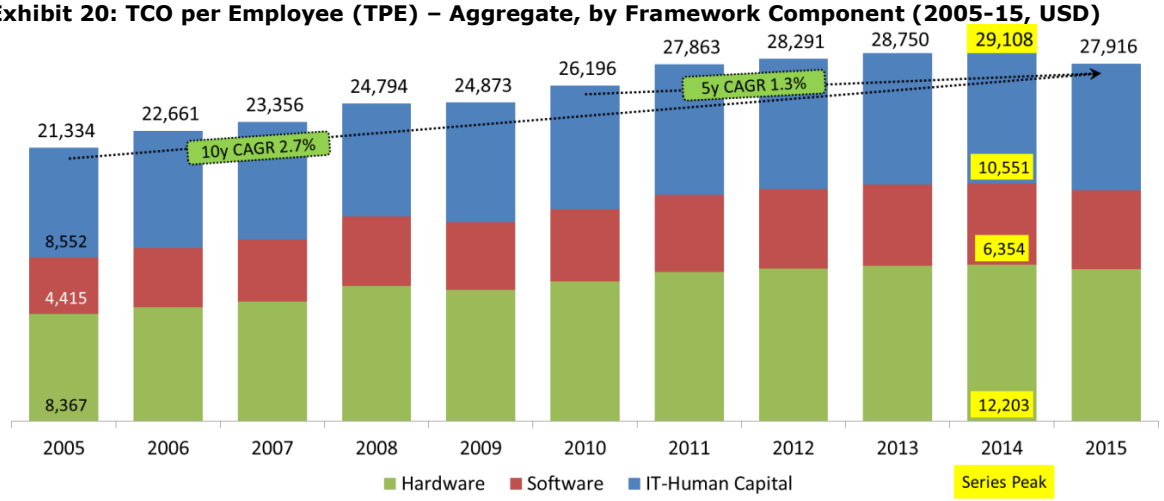
*The primary goal of this chapter is to share select Alphacution composite model output by various key perspectives, including observations by framework components, by region and country, by workflow categories (or roles), and by firm type or business segment.*

The last of the major steps that are necessary to convert and normalize the output from the Modeling Background and Analytical Foundation sections into meaningful benchmarks is a consistent denominator. It turns out that the best universal denominator for enterprise or business segment TCO is *employees* – or, more precisely, *full-time equivalent* (FTE) employees. The evidence and perspectives on TCO segmentations that follow – including by framework component, by region and country, by role (front to back of workflow), and by business segment - are possible because they have each been normalized by FTEs that are disclosed and reported by each company in the Model.

## TCO Observations by Framework Component

Exhibit 20 showcases the first glimpse of *per employee* TCO analytics which is the equivalent of the Model enterprise TCO from Exhibit 18. This exhibit illustrates that the TCO per employee (TPE) grew *every year* – even after GFC impacts of 2008 - from 2005 until it peaked at US$29,108 in 2014. 2015 is the only year in the series so far that yields a decline – a significant 4.1% decline from 2014 to US$27,916[8].

**Exhibit 20: TCO per Employee (TPE) – Aggregate, by Framework Component (2005-15, USD)**




*Source: Alphacution, Company Data*

Overall, our Sample (net enterprise) TPE has slowed since 2011. This can be observed by comparing the 10-year CAGR of 2.7% to the 5-year CAGR of 1.3%. Basically, post-GFC rate of growth in TPE has slowed by more than half. And, as has been shown in previous examples, this slowdown is increasingly concerning as an indicator of market fundamentals, particularly given its pervasiveness. Though *some* of this decline could be explained by adoption of new, digital-era *more-for-less* solutions, we know that such

[8] In the peak year of 2014, hardware, software, and IT human capital spending per FTE was US$12,203, US$6,354, and US$10,551, respectively.

adoption is not nearly sufficient to explain such a pull back after a consistently positive 10-year run.

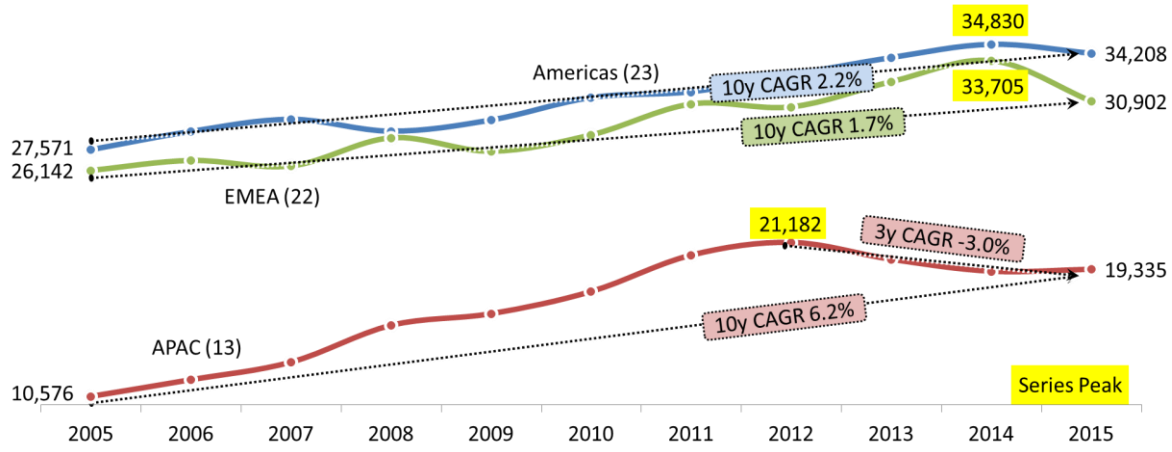
## TCO Observations by Region and Country

Exhibit 21 showcases the TPE by the three core regions in the study – Americas, APAC and EMEA. Among the leading observations, technology spending appears to move in lockstep independent of region – at least until 2012 when APAC begins to lead all regions in divergence. This consistent global technology spending pattern is confirmed by very high correlations, where the Americas-EMEA correlation is 0.93 and the West relative to APAC is 0.85.

Now, given prior regional analytics, we already know and expect that APAC typically marches to the beat of its own drummer, but the least of which when it comes to technology spending. In the case of tech spend, APAC grew with the West and pretty much slowed with the West too (refer back to Exhibit 6).

However, when we apply a *per employee* lens to the analysis, it becomes clear that – as of 2012 – tech spending did not keep pace with growth in headcount – which is another way of saying that automated processing did not grow as strongly as manual processing. This APAC divergence from the West will become clearer once we explore country-specific TPE trends, since this region's analytics are so heavily influenced by China – and this automated vs manual narrative is most uniquely Chinese.

**Exhibit 21: TCO per Employee (TPE) by Region (2005-2015, USD)**




*Source: Alphacution, Company Data*

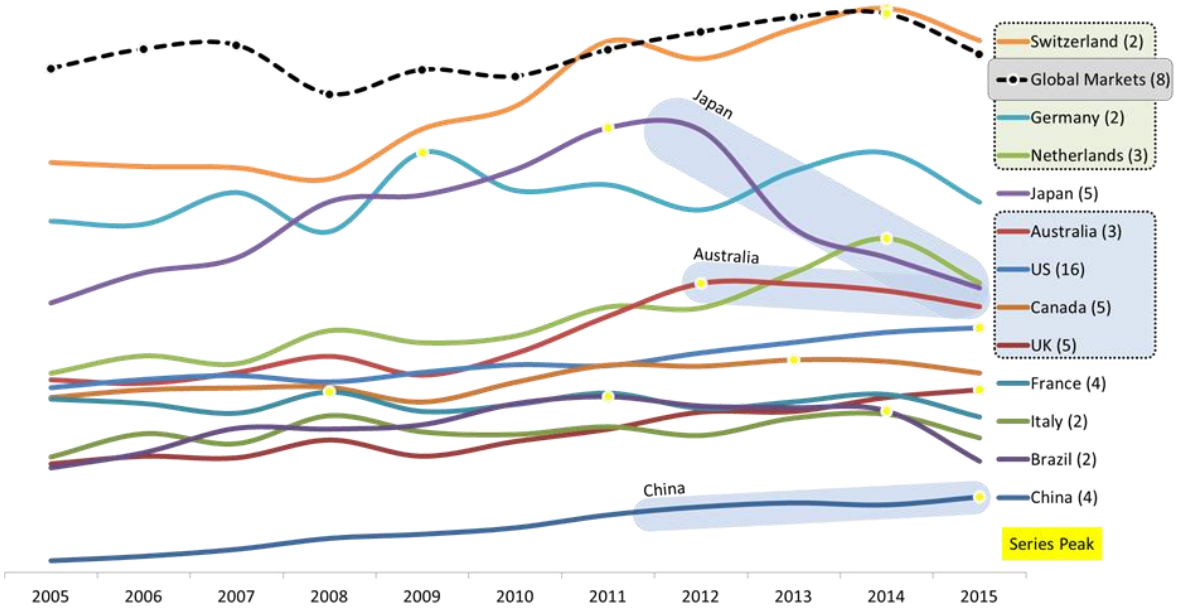
Another notable finding here is the absolute tech spending levels and shifts, where Americas and EMEA exhibit almost identical volatility (as measured by standard deviation over the full 11-year period) – and APAC relative to the West is significantly lower.

Enhanced understanding of regional technology spending divergences requires looking a layer deeper into the country-specific patterns – and ultimately down further into individual company models (see Exhibit 22).

There are numerous stories buried inside each of these wiggly lines, but let's start by looking more closely at the major APAC countries in the Sample – Japan, Australia and China: By 2012, Japan is hit with a perfect storm of factors that impact its TPE analytics. Headcount is growing at the same time that overall technology spending is falling, placing extra downward pressure on TPE. On top of all that, the USD-JPY cross-rate is in serious decline. Meanwhile, Australia doesn't help regional analytics since its TPE is also in slow decline – and all while consistent increases in tech spending by Chinese banks simply isn't strong enough to counterbalance the declines.

**Exhibit 22: TCO per Employee (TPE) by Country (2005-2015)[9]**




*Source: Alphacution, Company Data*

The bottom line for APAC, however, is that it is more geographically, culturally, and technologically dispersed than any other region. Meanwhile, it's a critical region for any major market participant as more global, macro, multi-asset and multi-temporal strategies become necessary in this next era of modern financial markets. The problem with this last statement, however, is the expense of connecting to and operating in more and more APAC liquidity venues given the aforementioned dispersion issues.

Another notable observation worth pointing out here is the high level of Swiss and German bank TPE relative to other countries. If we look at a diverse selection of 8 banking groups across 5 countries with high concentration in global markets, trading and/or investment banking business[10], we find that it is actually the technology spending "signature" of trading-oriented businesses that cause the high TPE – since trading businesses have traditionally been more heavily dependent upon expensive custom infrastructure and higher levels of technical leverage than other FSI segments.

[9] Transparency into individual company models, case studies and other analysis is available to subscribers to Alphacution's Premium Content Library.

[10] Including both Swiss-headquartered banking groups in the Model – shown in Exhibit 22 as "Global Markets (8)"

## TCO Observations by Workflow Category

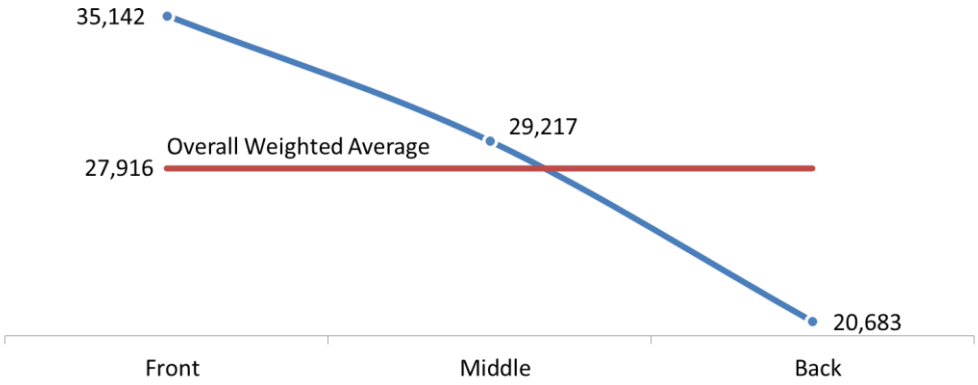
Alphacution believes that configuring the framework to develop "per-seat" workflow TPE benchmarks has great potential for tactical impacts on enterprise transformation. For this stage of the analysis, we have blocked out Sample headcount into 5 generic workflow roles: 3 vertical, production categories (front-, middle-, and back-office) and 2 horizontal, corporate center-type categories (management / administrative and tech / data personnel).

Though some transparency in the raw data and individual models yields clear breakdowns to serve as reference points – and unlike the estimation of software or IT human capital spend from the previous chapter - there still isn't enough data harvested yet to perform a similar analysis. In other words, our current input assumptions are subjective for the time being. Moreover, to further simplify this initial look at workflow TPE benchmarks, we have distributed the horizontal personnel categories into the 3 production categories. Full details on our assumptions to allocate the total technology budget and headcount across workflow and business segment categories are presented in Exhibit A3, Appendix.

***Shifting Trend**: In 2015, the average technology spending per FTE for global banks was nearly US$28,000.*

Applying the Group Average input assumptions we are able to develop a basic aggregated workflow TPE benchmark (see Exhibit 23). The top line reading of this is that for an estimated US$169 billion technology budget spent on just over 6 million FTEs for 2015, the overall weighted average tech spend per FTE (TPE) was US$27,916. Skewing this figure for production workflow categories yields the front-, middle- and back-office TPE estimates of US$35,142, US$29,217, and US$20,683, respectively.

**Exhibit 23: TCO per Employee (TPE) by Workflow Category (2015, USD)**




*Source: Alphacution, Company Data*

Of course, no one lives in this hypothetical world, except by coincidence. Each position along each workflow and for each business segment profile in the vast FSI ecosystem will *emit* its own unique technology spending patterns.

## TCO Observations by Workflow Category and Business Segment

To dig further into this, Alphacution has taken the generalized spending figures from Exhibit 23 and applied additional segmentations. These additional breakdowns include

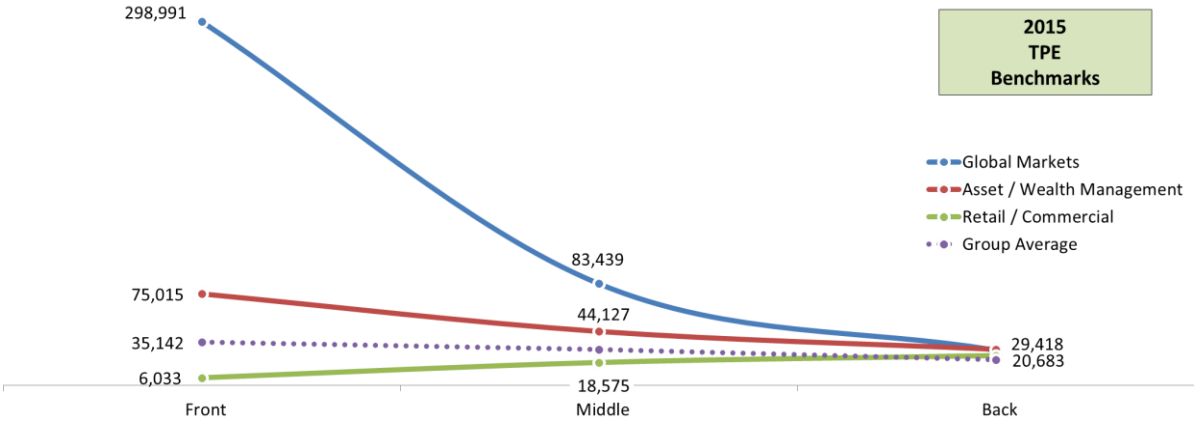
 

both horizontally by workflow category and vertically by business segment. The current business segment categories include global markets, asset / wealth management, and retail / commercial banking. This additional delineation by business segment is critical for the analysis because the technical usage "intensity" and FTE concentration for each workflow category / business segment pair is unique, and therefore, requires unique tactics for successful transformation.

The rationale behind these assumptions corresponds to an axiom presented earlier: *Higher-touch businesses have lower automation, and therefore, lower IT human capital allocations; lower-touch businesses have higher automation, and therefore, higher IT human capital allocations.* We can extend this concept further by noting that the allocation of human capital (or, manual processing) vs. technical leverage (or, automated processing) can be biased at different points in a workflow – and the balance of manual vs. automated tasks ultimately impacts the level of *agility* that is possible for that workflow. For instance, Alphacution believes – and evidence is supportive – that global markets headcount distribution shows lower weighting at the "front" of the workflow, heavier at the "back". In parallel, compute intensity tends to be heavier at the front and lighter at the back. In contrast, asset management is more balanced (than global markets) with regard to headcount and compute intensity across the workflow with the former biased to the front and the latter biased to the back. Following this, retail banking is further weighted to the front on headcount (higher touch) and further weighted to the back on compute intensity (more transactional).

Nevertheless, Exhibit 24 brings us to the final TPE benchmarks that are simultaneously broken down by workflow category and by business segment. Though the numbers are fascinating, at this stage of the analysis it is much more important to pay attention to the "shape" of the benchmarks. Alphacution believes that it is in the shape of things – and *influencing* of such shapes via new tools, technologies, and methods - that is among the most important aspects of transformation – and among the most important benefits from "quantifying the transformation." As such, we reiterate that these analytics are intended to serve as the digital equivalent of a divining rod, compass, or sextant for monitoring the progress of transformation.

**Exhibit 24: Workflow Category/Business Segment TPE Benchmarks (2015, USD)**




*Source: Alphacution, Company Data*

## Chapter IV - Key Points

- Converting tech spend estimates into *per employee* analytics allows Alphacution's framework to develop effective benchmarking and other decision support tools for groups of companies because the output is normalized with respect to (headcount) scale.
- TCO per employee (TPE) peaked in 2014 at ~US$29,100 – after growing consistently each year since 2005. However, a 4.1% TPE decline in 2015 to ~US$28,000 suggests deteriorating market fundamentals, and therefore, is an indication of increasing urgency for adoption of lower cost and yet higher agility solutions.
- In the peak year of 2014, hardware (HPE), software (SPE), and IT human capital (HCPE) spending per FTE was ~US$12,200, ~US$6,350, and ~US$10,550, respectively.
- Alphacution predicts that by the end of 2018, software spending per FTE will be the largest component of TPE.
- At a TPE of ~US$34,200 for 2015, Americas spend the most relative to EMEA and APAC – even though EMEA exhibits a similar level (~US$30,900) and high 11-year correlation (O.93) to the Americas. At the other end of the spectrum, APAC spends a fraction in TPE relative to Americas and EMEA for 2015 (~US$19,300) and the 11-year period (~US$16,800).
- The TPE disparity between APAC and both Americas and EMEA is largely due to the influence of Chinese banks on the weightings. Chinese banks have the highest headcounts and lowest TPEs relative to all other countries. That said, Chinese banks in our Sample have grown TPE consistently each year since 2005
- Japanese banks – with growth in headcount, declines in tech spending, and shifts in the USD-JPY exchange rate – are the primary source of APAC TPE divergence from Americas and EMEA from 2012.
- Alphacution believes that each unique business segment has a unique "technology spending signature." This phenomenon is illustrated by a group of 8 banks - the "Global Markets 8" - that have a high concentration of trading-oriented business and also have correspondingly high TPEs (because trading businesses are more heavily dependent upon expensive custom infrastructure and higher levels of technical leverage than other FSI segments).
- Alphacution estimates that banks spent an overall average of ~US$27,900 on technology per FTE for 2015.
- Alphacution estimates that front-office seats for trading business remain the most expensive with a TPE of ~US$299,000 for 2015.
- At this stage of the analysis, Alphacution believes that it is much more important to pay attention to the "shape" of the benchmarks, since influencing these shapes via new tools, technologies, and methods is among the most important aspects of transformation.

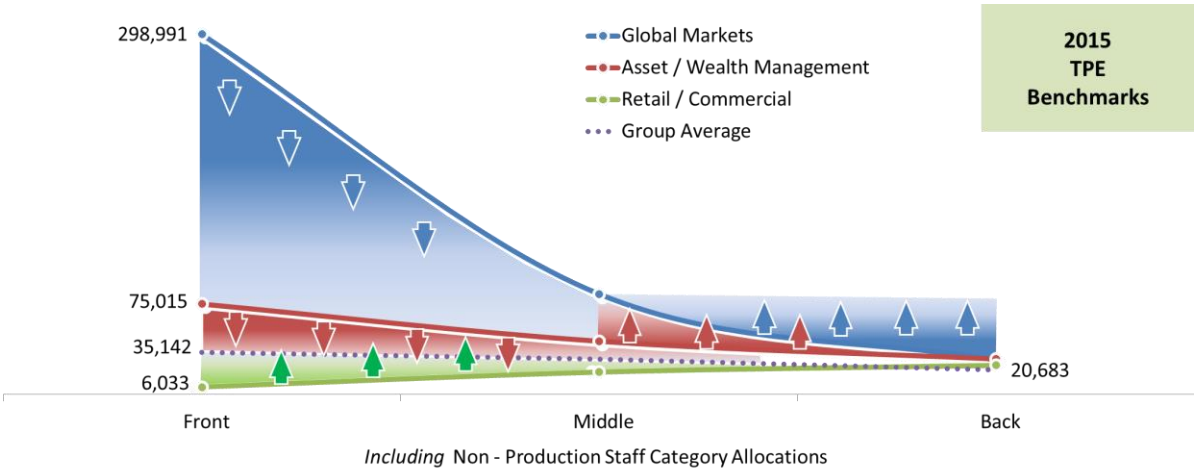
 

# Chapter V - Tactical Transformation

*The primary goals of this chapter are to demonstrate how TCO analytics and benchmarks are useful for measuring, monitoring and managing enterprise and business segments transformation, how process replacement is a more potent form of incremental agility relative to process reengineering, and how a focus on the adoption of managed services/IaaS offerings is a core tactic for process replacement, business transformation and higher operational agility.*

With the landscape dynamics, primary drivers and technology spending patterns laid out in the prior sections, we now finally turn to *how to use* these new tools for influencing change that results in enhanced performance at more optimized costs. Returning back to the suite of workflow TPE benchmarks from Exhibit 24, the key to influencing the balance of performance and cost is in "bending the lines," which is *mostly* a process re-engineering exercise (see Exhibit 25).

**Exhibit 25: Shifting TPE Benchmarks for Agility and Savings (2015, USD)**




*Source: Alphacution, Company Data*

In some cases, strategies for bending a benchmark will focus on lowering costs; in other cases, it will focus on new technology investments – meaning, potentially spending *more* – with the goal of yielding longer term and more persistent revenue enhancements. By our benchmark estimates, the fronts of global markets and asset management workflow(s) illustrate the greatest need for savings. Consider that a US$10,000 or 3.3% cost improvement on the TPE for global markets front office "seats" is worth just over US$1 billion in total savings (based on an estimated 102,324 FTEs in that category, see Exhibit A2). The same improvement for front office asset management seats is worth US$ 800 million in total savings (based on an estimated 322,476 FTEs in that category, see Exhibit A2). On the other side of the coin, optimized investments in tools and processing for the back ends of global markets and asset management workflows, as well as to the fronts of retail and commercial banking could impact the revenue potential of those workflows.

## Process Re-Engineering

Alphacution's overarching thesis for promoting agility is that workflows need to become more balanced. This means that through a combination of cost-reduction and selective investments (including partnerships), the TPE benchmarks from Exhibit 25 need to

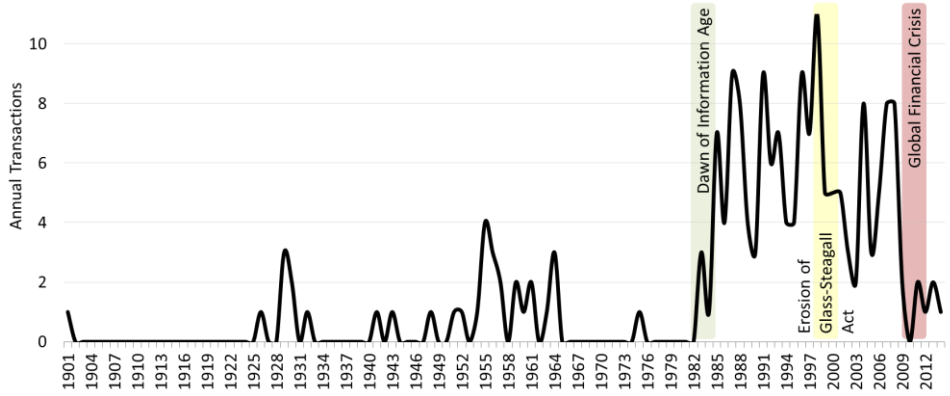
 

become "flatter" such that the *weakest* point in each workflow does not represent a bottleneck – and, optimally, the aggregated processing efficiency and flexibility of that workflow is maintained at a level of competitive advantage.

***Shifting Trend**: Optimized tech investment + selective tech partnerships = balanced workflow.*

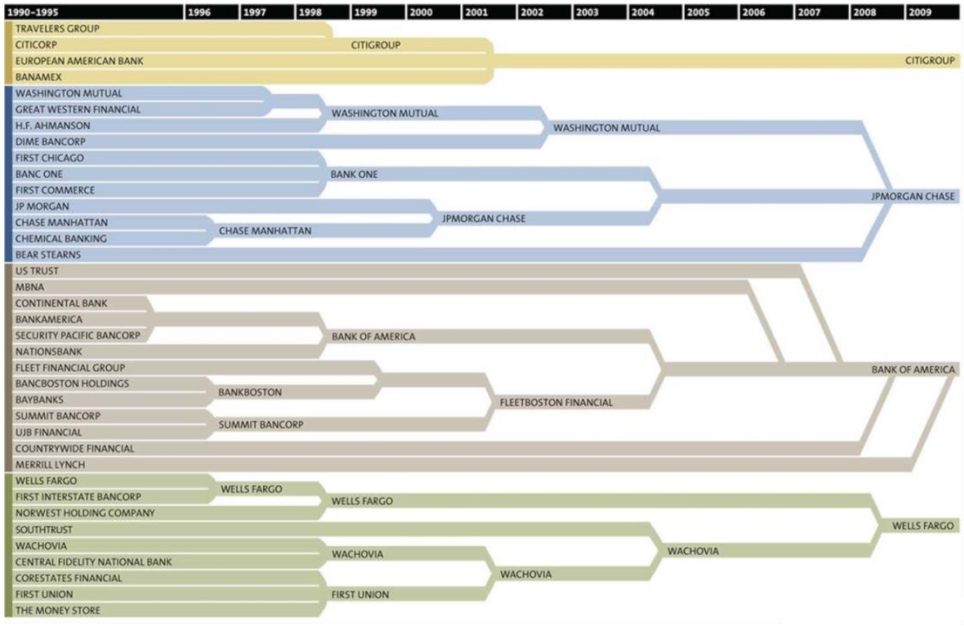
There are many common practices and events in recent banking history that explain how complexity and inefficiency materialized with the dawn of the Information Age in the early 1980s and the erosion of the Glass-Steagall Act in the late 1990s. Exhibits 26 and 27 illustrate how – mainly over the course of the dozen or so years prior to the GFC – 37 US banks fused into 4 megabanks.

**Exhibit 26: Modern Financial Complexity in US Banking (1901-2014)**




*Source: Wikipedia*

**Exhibit 27: 37 Becomes 4 and the Pre-GFC Fragmentation in US Banking (1990-2009)**




*Source: Federal Reserve, GAO*

Now, in the post-GFC era – and recalling the aforementioned convergence of mega-drivers – decades of operational indiscretions have come home to roost. Alphacution believes that only via perpetual process re-engineering - and selective process

replacement - can these complexities be properly addressed and ultimately yield a more competitive state of agility for market participants.

## Process Replacement

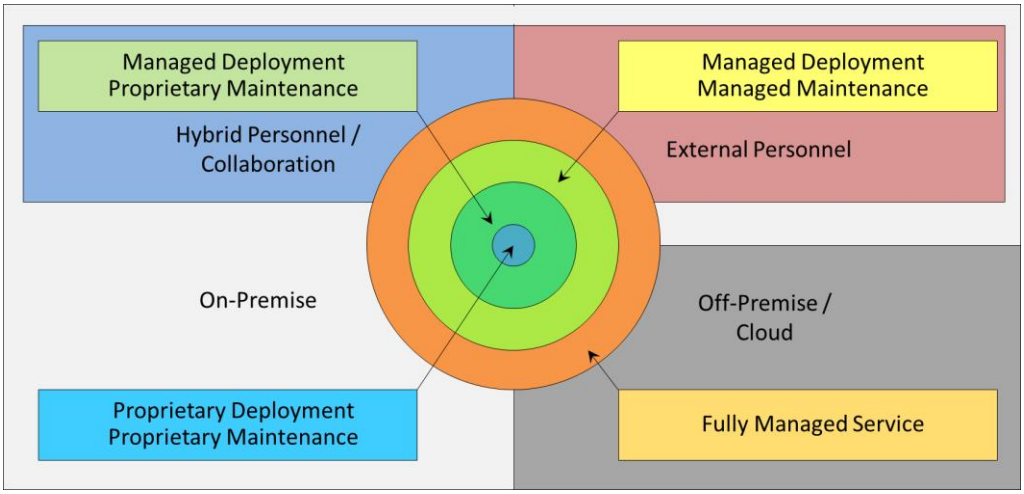
Occasionally, incremental process refinement can be skipped altogether in favor of process replacement. This is essentially where the most solid FinTech innovations come into play and have the greatest impact. For large incumbents, it is very challenging – and typically in conflict with historical operating procedures – to jettison a process that is still working. *If it ain't broke, don't fix it.* However, this traditional position is a luxury that large banking groups and other complex market participants can no longer afford to maintain. Increasingly pervasive regulations plus threats from FinTech innovators plus an unprecedented economic environment are drivers in the current landscape that all add up to a much higher – if not, *radical* – pace of change.

Process replacement in global markets has more options today than ever before. The timing of such a move goes like this: Though there a several steps between fully proprietary and fully managed – the major categories for which are highlighted in Exhibit 29 – one tactic for these larger, politically-sensitive technology buyers is to use the hardware and infrastructure refresh cycle to get off the "hamster wheel" of the old process and *replace* it with an entirely new process altogether. These days, this refresh cycle is on the shorter end of the common 3- to 10-year depreciation schedule.

***Question:*** *How has stretching legacy infrastructure worked for your firm?*

And, though these players may be tempted to stretch the life of their legacy infrastructures – typically because it can be a tool for meeting or beating earnings guidance – this tactic is far too short-sighted for the current environment. It doesn't factor the intangible value created by expediting the adoption of innovations. New deployment and management solutions for functionality like market data infrastructure, global liquidity/counterparty connectivity, and global storage/compute capacity management allow firms to shift costs and skills mix to where the "special sauce" now lives, which is in the discovery of better intelligence from an explosion of raw and derived big data.

**Exhibit 29: Proprietary v. Managed Services – Key Attribute Continuum**




*Source: Alphacution*

## One Universal Move

There are numerous tactics and strategies for achieving a higher state of agility. And, certainly, life would be easier if all of these were techno-centric. Unfortunately, they are not. Typically - and prior research has solidly borne this out that - cultural factors represent either the greatest impediment to or greatest facilitation for change, at any rate, whether that rate of change be radical or more pedestrian. And, these cultural factors are often heavily influenced by founders (e.g. – cults of personality), C-suiters and other senior management teams.

Though the detailed cultural change strategies are beyond the scope of this research, Alphacution believes that *shifts in organizational structure* to accommodate the aforementioned "corporate center" structure – where group-wide functions are organized, managed and deployed centrally – is a strong step towards setting a firm up to harvest TCO savings and ultimately foster incremental agility. So far, Alphacution has determined that at least 11 of the world's largest banking groups in its Model have taken solid steps in that direction. In the best case, the corporate center approach signals positive change, fosters enhanced collaboration (which is essential for the human capital equivalent of agility), and puts teams in a position to be clear on where high-cost redundancies, automatable and error-prone tasks, various forms of technical fragmentation, and other complexities reside.

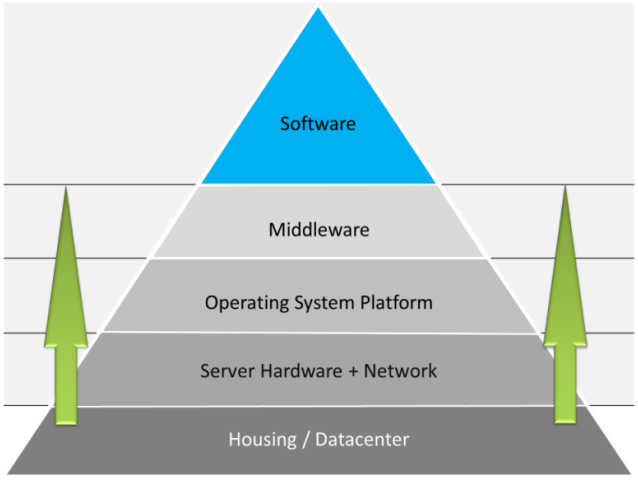
***Shifting Trend**: Complex enterprises with organizational structures that include "corporate centers" lead to TCO efficiencies.*

With cultural positioning poised to "lubricate" teams for an increasing pace of change and much higher levels of collaboration, there is *one universal move* that all of these firms need to be adopting with increasing frequency and for more of the enterprise workload: Commoditized – or, at least, democratized - functionality needs to be moved into managed services offerings and away from proprietary management.

Bluntly, this means large banks and other complex market participants must outsource infrastructure and certain functionality management to fully managed service offerings or cloud, hybrid cloud, and "X-as-a-Service" solutions. With few exceptions – where latency, high-performance computing (HPC), and/or other customized infrastructure configurations are critical to the alpha discovery and capture of a strategy – these firms need to migrate as much focus as possible higher in the "stack" to everything that sits on top of the infrastructure. In other words, become dedicated to establishing functionality that comes from proficiency in software development and other "intelligence processing" (see Exhibit 28, next page). In practice, this means maximizing your firm's focus on dramatically improved enterprise data management (EDM), new analytics development (often with higher compute intensities and update frequencies), and enhanced user interface (UI) / user experience (UX) design – this last area of which Alphacution typically puts under the umbrella of *human latency* and *information design*.

**Exhibit 28: Moving Higher in the Stack – Software and the Core Value Proposition Reset**




*Source: Alphacution*

## Chapter V - Key Points

- The key to influencing the balance of performance and cost is in balancing technology spending for each workflow, which – for large and complex incumbents - is *mostly* a process re-engineering exercise.
- In some cases, strategies for influencing a TCO benchmark will focus on lowering costs; in other cases, it will focus on new technology investments which may mean spending more.
- The fronts of global markets and asset management workflows illustrate the greatest potential for savings. A US$10,000 or 3.3% cost improvement on the TPE for global markets front-office "seats" is worth just over US$1 billion in total savings. The same improvement for front office asset management seats is worth US$ 800 million in total saving.
- Increases in mergers and acquisitions activity since the early 1980's – and most specifically in the decade prior to the GFC – caused unprecedented complexity in banking enterprises. This phenomenon is exemplified by the 4 largest banks in the US being the product of 37 smaller banks.
- Alphacution believes that a shift in organizational structures to minimize redundancies and harvest performance efficiencies for enterprise-wide functions is a strong initial step towards delivering TCO savings and ultimately fostering incremental agility.
- Process replacement is the most profound source of increased agility. The one universal process replacement move that firms need to be adopting: Commoditized/democratized - functionality processes needs to be moved into managed services offerings and away from proprietary management.
- Functionality that is ripe for greater managed services adoption includes market data infrastructure, global liquidity/counterparty connectivity, and global storage/compute capacity management. Another way to think of this: Proprietary development and management needs to focus higher in the "stack."

# Chapter VI - Conclusion

*The primary goals of this chapter are to summarize the most impactful findings from the analysis; introduce the first of Alphacution's T-Greeks™ operational analytics - the T-Spread™; and finally, to foreshadow the utility of additional analytics and broader TCO modeling.*

It may seem strange to declare at this stage of the presentation – after laying down so many numbers and elevating the virtues of adopting new "more-for-less" solutions – but in the final analysis it really doesn't matter what your firm spends on technology. What actually matters most is what your firm *receives* for its investment in technology. In turn, "technical leverage" is dependent on your firm's mix of people (What is the skills mix?), processing (Are your workflows robust, efficient and agile), and technology (Does your mix of tools and infrastructure collectively represent a competitive advantage?) for harvesting actionable intelligence from raw and derived data. In other words, is your firm receiving a "tech dividend" or paying a "tech debt"?

## Return on Technology: Introducing the T-Spread™ Benchmark

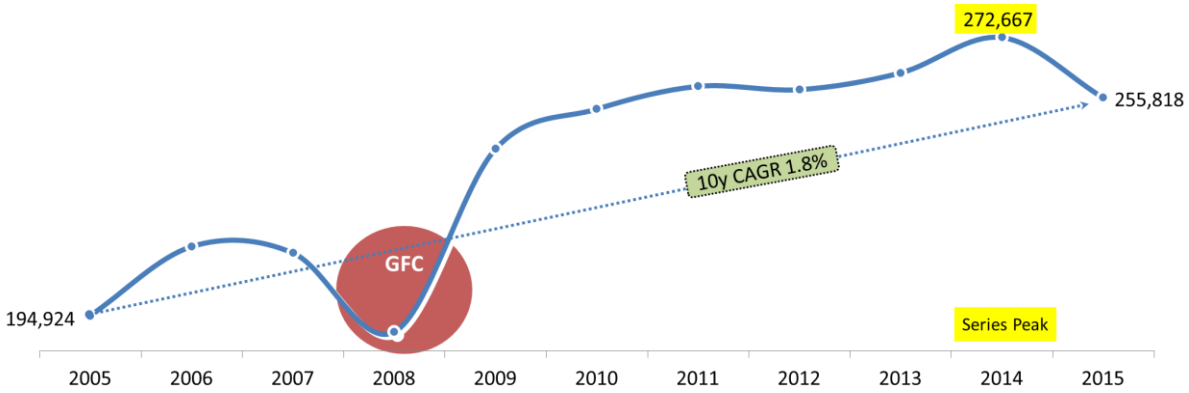
It turns out that this so-called "return on technology" concept is *quantifiable* by normalizing and benchmarking the difference between performance (revenue) and the cost of that performance (technology spending). The foundational ingredients for this conclusion have been laid out throughout this report. Furthermore, since technology spending patterns are quantifiable, Alphacution believes that this new type of intelligence can then be used to monitor and *navigate* the process of transformation from a strategic perspective. Moreover, these analytics and benchmarks can be used for more tactical transformation as well, ultimately providing more detailed visibility for solution selection and workflow re-engineering / replacement.

***Question**: What is your firm's current "return" from its technical infrastructure?*

This is where we introduce Alphacution's T-Spread™ Benchmark. This analytic is designed to convert the concept of return on technology into actionable intelligence. It is calculated simply by taking the difference between revenue per employee (RPE) and TCO per employee (TPE). Understanding the value of the T-Spread™ is straight-forward, as well: A higher T-Spread™ (relative to another T-Spread™) represents higher return on technology and a lower T-Spread™ represents the opposite. Beyond that, we typically use a series of T-Spreads™ over a range of time in order to diffuse the impact of business cycles, as is illustrated from the 2008-2009 period of the GFC (see Exhibit 30). Furthermore, with a 10-year CAGR of 1.8% we might consider for future research and modeling that such a pace of growth in T-Spread™ is a reasonable proxy for the pace of the practical application of innovation among global banks – and the broader FSI ecosystem.

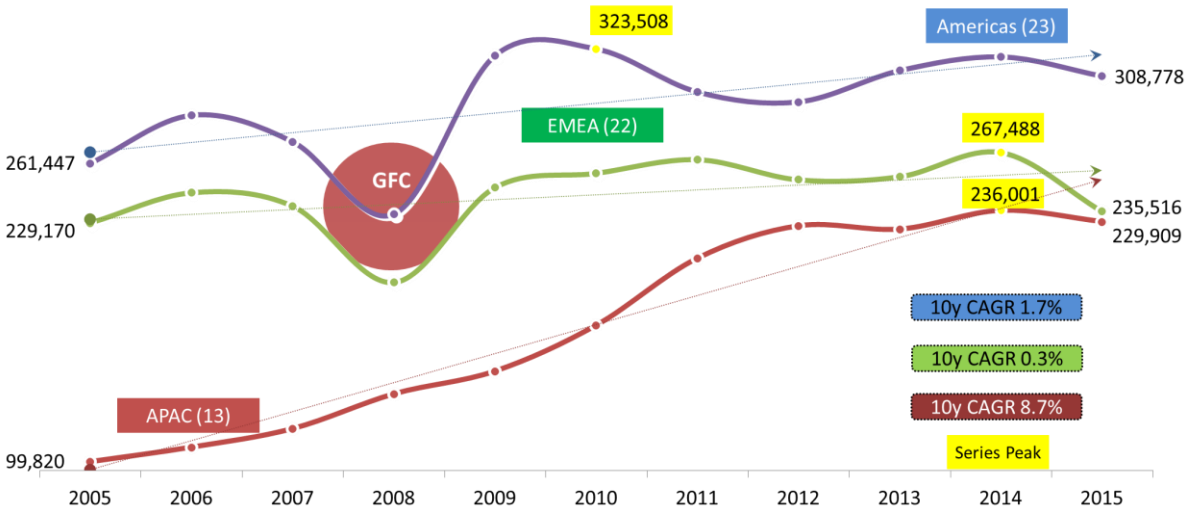
**Exhibit 30: Weighted Average T-Spread™ for Sample Banks (2005-2015, USD)**




*Source: Alphacution, Company Data*

From this high level, we can begin to delineate the results for specific cross sections of the Sample. For instance, T-Spread™ by region showcases numerous observations: Some of the more obvious observations include how the Americas region – with a heavy concentration of US-headquartered banks – has consistently led the other regions in harvesting more net output per FTE than the other regions (and showing a region-leading T-Spread™ of US$308,778 for 2015). Also, APAC – largely due to evolution of Chinese banks – has nearly caught up with long term T-Spread™ levels for EMEA, and to a lesser extent, the Americas. And finally, we wonder if the uncharacteristic decline of 12% in the EMEA T-Spread™ from 2014 to 2015 is a harbinger of global trends – or a return to GFC-like trends - given that EMEA has typically been a leading indicator of declines in revenue, headcount, and tech spending since the beginning of the post-GFC period (see Exhibit 31).

**Exhibit 31: Weighted Average T-Spread™ for Sample Banks by Region (2005-2015, USD)**



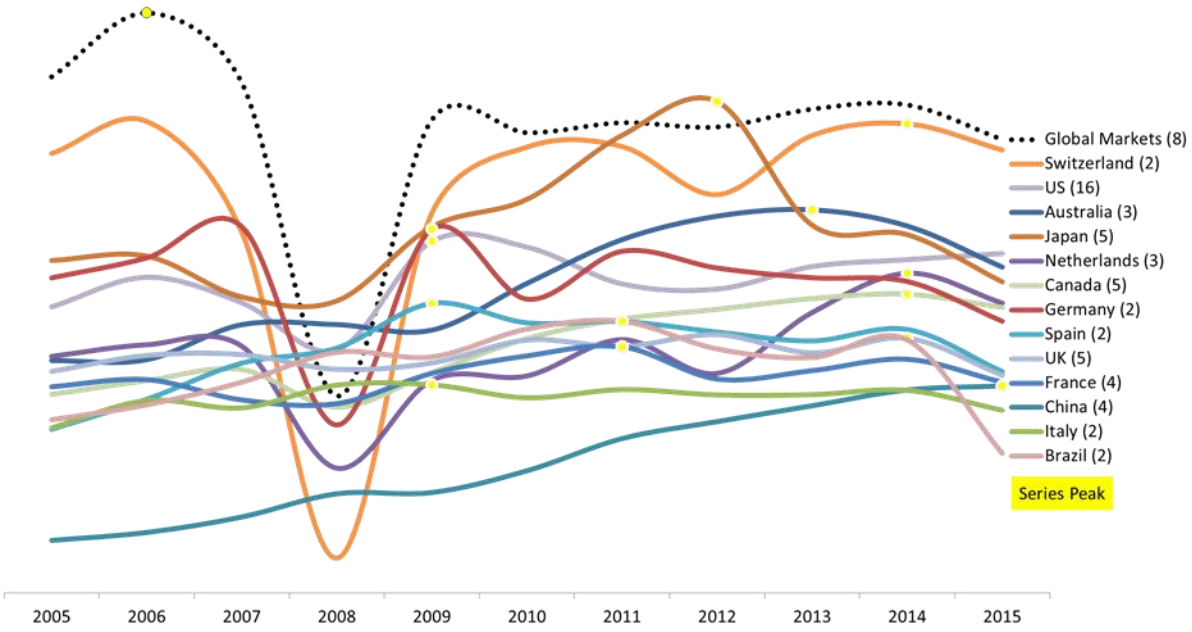

*Source: Alphacution, Company Data*

Taking this exploration a step further, T-Spread™ by country provides additional highlights: First, it showcases a small subset of countries where the GFC originally

made "landfall" in 2008 (which correspond directly to banks with heavy global markets exposure). It also showcases how most country's banks T-Spreads™ are down in the past year or more with the notable exception of Chinese banks which have consistently harvested more performance from increasing tech spend (see Exhibit 32).

**Exhibit 32: Weighted Average T-Spread™ for Sample Banks by Country (2005-2015, USD)**




*Source: Alphacution, Company Data*

Similar to Exhibit 22, we use the Global Markets (8) basket of banking groups with high concentration to trading and investment banking segments to further showcase who was and who was not at "ground zero" for the GFC – and perhaps more importantly – how this special group responded (in terms of return on technology) in its aftermath. Alphacution's reading of the post-2009 *variance* of T-Spreads™ for global markets-concentrated banking groups is eerily low – and begs the question of how they might respond to an upcoming or future period of volatility given how much work has already been done on technology footprints in the past 5-6 years.

## Foreshadowing the T-Greeks™ Operational Analytics Framework[11]

In closing, we want to drop a few bread crumbs for what comes next with Alphacution's mission to develop better tools for quantifying and navigating organizational transformation in the digital era: Underneath all the benchmarking lines are the "technical signatures" of individual companies and their unique blend of businesses (each of which also have a form of technical signature). For this report, we have focused almost exclusively on the largest and most diverse banking groups in the world, but the point needs to be made that the framework is relevant to a 360° view of profiles in the FSI ecosystem – and longer term, to encompass other industries, as well.

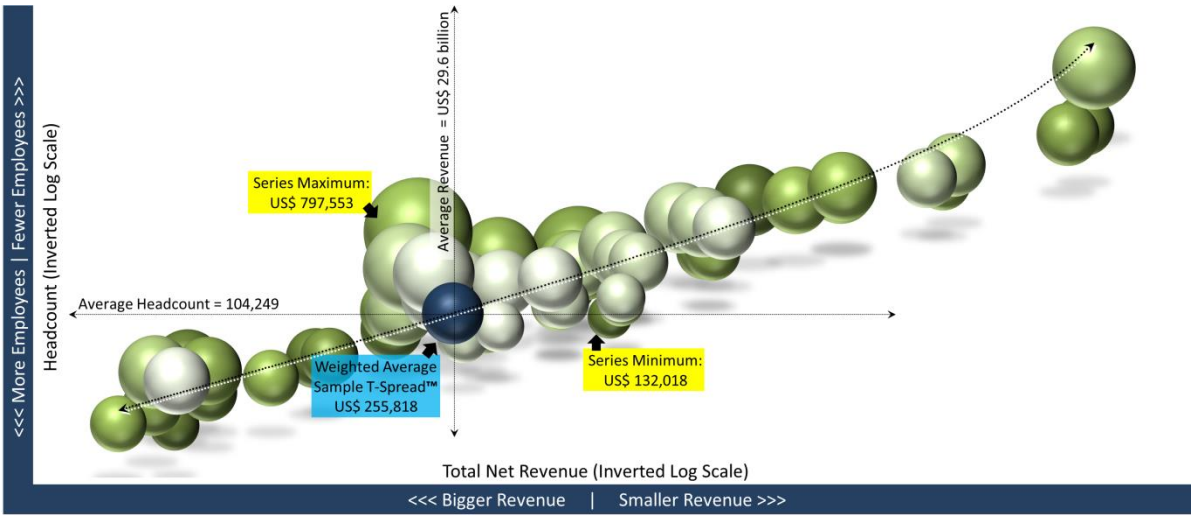
[11] T-Greeks, T-Spread and related analytics from Alphacution's operational analytics framework are pending trademarks of Alphacution Research Conservatory, LLC.

In Exhibit 33, we showcase where each individual banking group's T-Spread™ lives in relationship to the aggregate of the Sample for 2015 – where the weighted average T-Spread is nearly US$256,000 for 2015. Beyond this benchmark, the utility of this information is broad, particularly for individual banking groups to understand where they fit and how they are moving relative to the group. Also, note carefully that these comparative *variances* – including for points in time as well as over ranges of time – form the basis for a broader "*techno-operational"* suite of analytics that we are calling the T-Greeks™ Operational Analytics Framework.

***Shifting Trend**: The weighted-average T-Spread for the Sample banking groups was US$256,000 for 2015.*

**Exhibit 33: T-Spread™ Benchmark 2015 – 58 Large Global Banks**




*Source: Alphacution, Company Data*

Final point: Not only are technology spending analytics valuable for management teams to have more prescriptive tools for decision-making, but it also turns out that partners to these firms – and the sales organizations within them - can also use them to design better solutions and pricing strategies that help influence their client's return on technology, as well.

Alphacution has much more to come on the journey of quantifying transformation and activating operational agility. Stay tuned…

## Chapter VI - Key Points

- It really doesn't matter what your firm spends on technology; what your firm *receives* for its investment in technology – or its "return on technology" - matters most.
- Return on technology (RoT) is dependent on your firm's skills mix, processing efficiency and agility, and mix of tools and technologies for harvesting actionable intelligence from raw and derived data. In other words: Is your firm receiving a tech dividend or paying a tech debt?
- Alphacution's T-Spread benchmark analytic is useful for quantifying enterprise return on technology – the spread between performance and cost of performance – and therefore, converts this concept into actionable intelligence to assist in the navigation towards more operational agility.
- T-Spread = Revenue per Employee (RPE) – TCO per Employee (TPE).
- The weighted average T-Spread for the Sample banking groups was nearly US$256,000 for 2015.
- A higher T-Spread (relative to another T-Spread) represents higher "return on technology" and a lower T-Spread™ represents the opposite.
- The T-Spread operational analytic is a member of Alphacution's T-Greeks operational analytics benchmarking framework for quantifying and navigating organizational transformation
- Alphacution believes that operational analytics, like T-Spread and the broader T-Greeks Operational Analytics Framework, are useful for both buyers and sellers of technology, tools and solutions.
- Adoption of managed services and/or IaaS offerings – particularly for areas of functionality that have become commoditized or democratized – and engaging in process re-engineering or replacement are the leading strategies for improving return on technology in the current environment.

# Appendix

**Exhibit A1: List and Key Attributes of Banking Groups in the Sample**

| Entity | Country | Currency | 50[1] | 100 | GSIB[2] | Dealer[3] |
|---|---|---|---|---|---|---|
| ABN Amro Group NV | Netherlands | EUR | | | | |
| Agricultural Bank of China, Ltd. | China | CNY | 6 | | 1 | |
| Australia and New Zealand Banking Group, Ltd. | Australia | AUD | | | | |
| Banco Bilboa Vizcaya Argentaria SA (BBVA) | Spain | EUR | | | | |
| Banco do Brasil SA | Brazil | BRL | | | | |
| Banco Santander SA | Spain | EUR | | | 1 | |
| Bank of America Corp | US | USD | 5 | | 2 | |
| Bank of China, Ltd. | China | CNY | 4 | | 1 | |
| Bank of Montreal | Canada | CAD | | | | |
| Bank of New York Mellon Corp. | US | USD | | | 1 | |
| Bank of Nova Scotia | Canada | CAD | | | | |
| Barclays Plc | UK | GBP | | | 3 | |
| BGC Partners | US | USD | | | | Cantor |
| BNP Paribas SA | France | EUR | | | 3 | |
| Canadian Imperial Bank of Commerce | Canada | CAD | | | | |
| China Construction Bank Corp. | China | CNY | 2 | | 1 | |
| Citigroup, Inc. | US | USD | 7 | | 3 | |
| Comerica | US | USD | | | | |
| Commerzbank AG | Germany | EUR | | | | |
| Commonwealth Bank of Australia | Australia | AUD | | | | |
| Credit Agricole Group | France | EUR | | | 1 | |
| Credit Suisse Group AG | Switzerland | CHF | | | 2 | |
| Daiwa Securities Group Inc. | Japan | JPY | | | | |
| Danske Bank A/S | Denmark | DKK | | | | |
| Deutsche Bank AG | Germany | EUR | | | 3 | |
| Development Bank of Singapore | Singapore | SGD | | | | |
| Fifth Third | US | USD | | | | |
| Goldman Sachs Group, Inc. | US | USD | | | 2 | |
| Groupe BPCE | France | EUR | | | 1 | |
| HSBC Holdings Plc | UK | USD | 9 | | 4 | |
| Industrial and Commercial Bank of China, Ltd. | China | CNY | 1 | | 1 | |
| ING Bank NV | Netherlands | EUR | | | 1 | |
| Intesa Sanpaolo SpA | Italy | EUR | | | | |
| Itau Unibanco Holding SA | Brazil | BRL | | | | |
| Jefferies LLC | US | USD | | | | |
| JP Morgan Chase & Co. | US | USD | 3 | | 4 | |
| Key Bank | US | USD | | | | |
| Lloyds Banking Group Plc | UK | GBP | | | | |
| Mitsubishi UFJ Financial Group Inc. | Japan | JPY | 10 | | 2 | |
| Mizuho Financial Group Inc. | Japan | JPY | | | 1 | |
| Morgan Stanley | US | USD | | | 2 | |
| National Australia Bank, Ltd. | Australia | AUD | | | | |
| Nomura Holdings Inc | Japan | JPY | | | | |
| Nordea Bank AB | Sweden | EUR | | | 1 | |
| Northern Trust | US | USD | | | | |
| PNC Financial Services Group Inc. | US | USD | | | | |
| Rabobank Group | Netherlands | EUR | | | | |
| Royal Bank of Canada | Canada | CAD | | | | |
| Royal Bank of Scotland Group Plc | UK | GBP | | | 1 | |
| Société Générale | France | EUR | | | 1 | |
| Standard Chartered Pls | UK | USD | | | 1 | |
| State Street | US | USD | | | 1 | |
| Sumitomo Mitsui Financial Group Inc. | Japan | JPY | | | 1 | |
| Toronto-Dominion Bank | Canada | CAD | | | | |
| UBS AG | Switzerland | CHF | | | 1 | |
| Unicredit Group SpA | Italy | EUR | | | 1 | |
| US Bancorp | US | USD | | | | |
| Wells Fargo & Co. | US | USD | 8 | | 1 | |

Notes: 1) Numbers indicate Tier 1 Capital ranking 2015; 2) Numbers indicate global systematically important bank (G-SIB) loss absorbancy bucket; 3) Primary dealer list 2014

*Source: Alphacution, The Banker, Financial Stability Board, NY Federal Reserve*

**Exhibit A2: TCO Variables, Benchmarking Formulas for Workflow Categories**

$$\text{Average Annual TCO}_{\text{All Employees}} = \frac{\text{Total \$ (HC + HW + SW + D)}}{\text{Total Employees}}$$

$$\text{Average Annual TCO}_{\text{Staff Category}} = \frac{[\text{Use Case Intensity}_{\text{Staff Category}}] * [\text{Total \$ (HC + HW + SW + D)}]}{\text{Est. Employees}_{\text{Staff Category}}} \quad \text{where:}$$

$$\text{HC} = (\text{Average Annual Compensation}_{\text{All Employees}}) * (\text{Est. IT and related personnel})$$

HC = human capital
HW = hardware and infrastructure
SW = software and processing
D = data and analytics, and
NHC = non-human capital
NHC = HW + SW + D

Staff Categories:
Front Office
Middle Office
Back Office
IT and Related Personnel
Management and Administration

*Source: Alphacution, Company Data*

**Exhibit A3: Workflow/Segment Benchmark Construction–Detailed Assumption Matrices (2015)**

| Benchmarks DO NOT INCLUDE Non-Production Personnel | | | | |
|---|---|---|---|---|
| **Headcount (%)** | **Group Avg** | **Retail** | **Wealth** | **Markets** |
| Management / Admin | 5% | 5% | 5% | 5% |
| Tech / Data Personnel | 20% | 10% | 20% | 30% |
| *Production* | *75%* | *85%* | *75%* | *65%* |
| Front | 25% | 45% | 20% | 11% |
| Middle | 22% | 20% | 25% | 22% |
| Back | 27% | 20% | 30% | 32% |

| **Usage Intensity (%)** | **Group Avg** | **Retail** | **Wealth** | **Markets** |
|---|---|---|---|---|
| Management / Admin | 1% | 1% | 1% | 1% |
| Tech / Data Personnel | 20% | 20% | 20% | 20% |
| *Production* | *79%* | *79%* | *79%* | *79%* |
| Front | 32% | 19% | 34.0% | 43% |
| Middle | 25% | 26% | 25.0% | 24% |
| Back | 22% | 34% | 20.0% | 12% |

| **Spend Allocation** | **Group** | **Retail** | **Wealth** | **Markets** |
|---|---|---|---|---|
| | *100%* | 33% | 33% | 33% |
| | $ 168,791 | $ 56,208 | $ 56,208 | $ 56,208 |

| **Spend Breakdown ($)** | **Group** | **Retail** | **Wealth** | **Markets** |
|---|---|---|---|---|
| Management / Admin | $ 1,688 | $ 562 | $ 562 | $ 562 |
| Tech / Data Personnel | $ 33,758 | $ 11,242 | $ 11,242 | $ 11,242 |
| *Production* | *$ 133,345* | *$ 44,404* | *$ 44,404* | *$ 44,404* |
| Front | $ 54,013 | $ 10,679 | $ 19,111 | $ 24,169 |
| Middle | $ 42,198 | $ 14,614 | $ 14,052 | $ 13,490 |
| Back | $ 37,134 | $ 19,111 | $ 11,242 | $ 6,745 |
| | $ 168,791 | $ 56,208 | $ 56,208 | $ 56,208 |

| **Headcount Allocation** | **Group** | **Retail** | **Wealth** | **Markets** |
|---|---|---|---|---|
| | *100%* | 70% | 20% | 10% |
| | 6,046,430 | 4,232,501 | 1,209,286 | 604,643 |

| **Headcount** | **Group Avg** | **Retail** | **Wealth** | **Markets** |
|---|---|---|---|---|
| Management / Admin | 302,322 | 211,625 | 60,464 | 30,232 |
| Tech / Data Personnel | 1,209,286 | 423,250 | 241,857 | 181,393 |
| *Production* | *4,534,823* | *3,597,626* | *906,965* | *393,018* |
| Front | 1,531,762 | 1,904,626 | 241,857 | 66,511 |
| Middle | 1,350,369 | 846,500 | 302,322 | 133,021 |
| Back | 1,652,691 | 846,500 | 362,786 | 193,486 |
| | 6,046,430 | 4,232,501 | 1,209,286 | 604,643 |

| **Benchmarks** | **Group Avg** | **Retail** | **Wealth** | **Markets** |
|---|---|---|---|---|
| Management / Admin | 5,583 | 2,656 | 9,296 | 18,592 |
| Tech / Data Personnel | 27,916 | 26,560 | 46,480 | 61,973 |
| *Production* | *29,405* | *12,343* | *48,959* | *112,982* |
| Front | 35,262 | 5,607 | 79,016 | 363,389 |
| Middle | 31,249 | 17,264 | 46,480 | 101,411 |
| Back | 22,469 | 22,576 | 30,987 | 34,860 |

| Benchmarks INCLUDE Non-Production Personnel | | | | |
|---|---|---|---|---|
| **Headcount (%)** | **Group Avg** | **Retail** | **Wealth** | **Markets** |
| Management / Admin | 0% | 5% | 5% | 5% |
| Tech / Data Personnel | 0% | 10% | 20% | 30% |
| *Production* | *100%* | *100%* | *100%* | *100%* |
| Front | 32% | 53% | 27% | 17% |
| Middle | 30% | 24% | 33% | 34% |
| Back | 38% | 24% | 40% | 49% |

| **Usage Intensity (%)** | **Group Avg** | **Retail** | **Wealth** | **Markets** |
|---|---|---|---|---|
| Management / Admin | 0% | 1% | 1% | 1% |
| Tech / Data Personnel | 0% | 20% | 20% | 20% |
| *Production* | *100%* | *100%* | *100%* | *100%* |
| Front | 41% | 24% | 43% | 54% |
| Middle | 32% | 33% | 32% | 30% |
| Back | 28% | 43% | 25% | 15% |

| **Spend Allocation** | **Group** | **Retail** | **Wealth** | **Markets** |
|---|---|---|---|---|
| | *100%* | 33% | 33% | 33% |
| | $ 168,791 | $ 56,208 | $ 56,208 | $ 56,208 |

| **Spend Breakdown ($)** | **Avg** | **Retail** | **Wealth** | **Markets** |
|---|---|---|---|---|
| Management / Admin | $ - | $ - | $ - | $ - |
| Tech / Data Personnel | $ - | $ - | $ - | $ - |
| *Production* | *$ 168,791* | *$ 56,208* | *$ 56,208* | *$ 56,208* |
| Front | $ 68,371 | $ 13,518 | $ 24,191 | $ 30,594 |
| Middle | $ 53,415 | $ 18,499 | $ 17,787 | $ 17,076 |
| Back | $ 47,005 | $ 24,191 | $ 14,230 | $ 8,538 |
| | $ 168,791 | $ 56,208 | $ 56,208 | $ 56,208 |

| **Headcount Allocation** | **Group** | **Retail** | **Wealth** | **Markets** |
|---|---|---|---|---|
| | *100%* | 70% | 20% | 10% |
| | 6,046,430 | 4,232,501 | 1,209,286 | 604,643 |

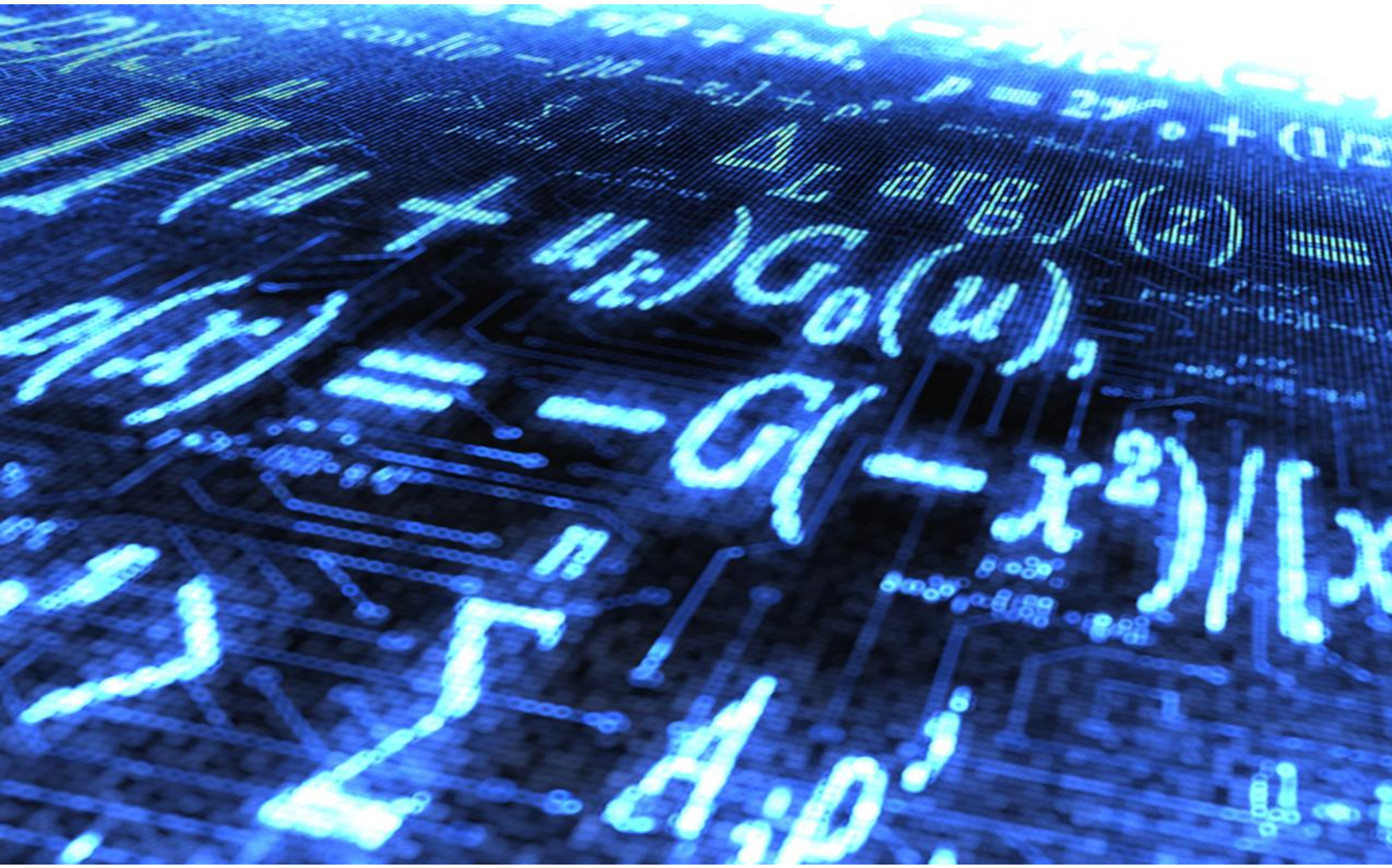
| **Headcount** | **Group Avg** | **Retail** | **Wealth** | **Markets** |
|---|---|---|---|---|
| Management / Admin | - | - | - | - |
| Tech / Data Personnel | - | - | - | - |
| *Production* | *6,046,430* | *4,232,501* | *1,209,286* | *604,643* |
| Front | 1,945,558 | 2,240,736 | 322,476 | 102,324 |
| Middle | 1,828,217 | 995,883 | 403,095 | 204,648 |
| Back | 2,272,655 | 995,883 | 483,714 | 297,670 |
| | 6,046,430 | 4,232,501 | 1,209,286 | 604,643 |

| **Benchmarks** | **Group Avg** | **Retail** | **Wealth** | **Markets** |
|---|---|---|---|---|
| Management / Admin | - | - | - | - |
| Tech / Data Personnel | - | - | - | - |
| *Production* | *27,916* | *13,280* | *46,480* | *92,960* |
| Front | 35,142 | 6,033 | 75,015 | 298,991 |
| Middle | 29,217 | 18,575 | 44,127 | 83,439 |
| Back | 20,683 | 24,291 | 29,418 | 28,682 |

= Input Variables
= Output Variables

*Source: Alphacution, Company Data*



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