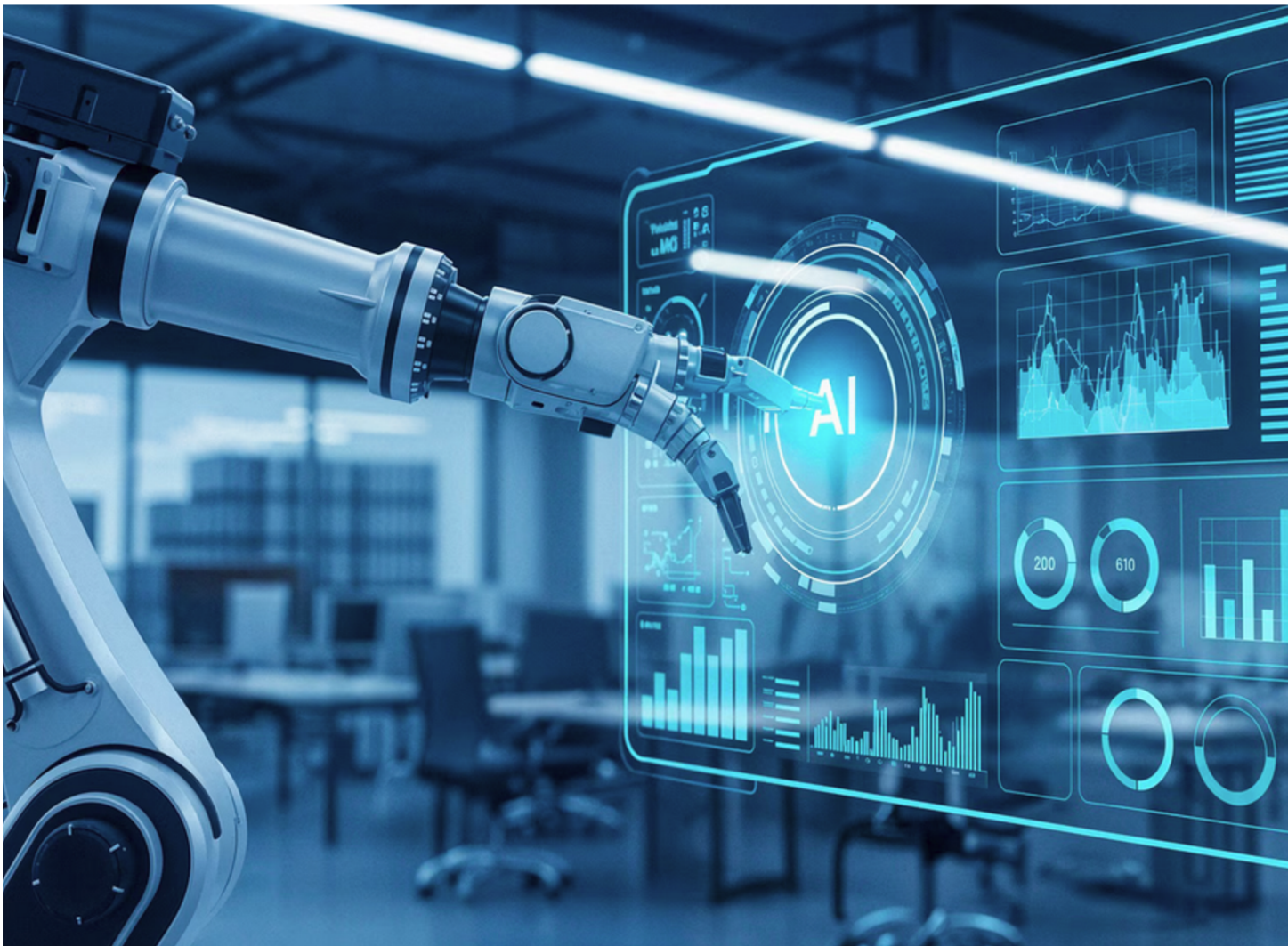


INSIDER'S PERSPECTIVE

INVESTING IN SOFTWARE R&D

What got you here won't get you there:
Hardware vs. Software R&D – A different game
with different rules

by Dr. Robert Schenk, Fabian Czilwa, Christopher Mühlbach, Dr. Michael Müller



Key takeaways

- Software is an opportunity.** Compared to hardware-focused industries, Software companies enjoy, on average, higher profitability (2x) and growth (4x): Most Software companies (63%) show growth rates well beyond 15% with more than 1/3 enjoying growth rates of more than 30%.
- Growth and profitability follow investment.** Companies that strategically increase R&D spending show sustained revenue growth and higher profitability, with a strong positive correlation ($r_s = 0.9$).
- R&D is to software what operations are to hardware.** The production of application software happens within R&D and does not require manufacturing operations or physical shipping, generally leading to lower Cost of Goods Sold and higher Gross Profit which can – and should – be reinvested in Software R&D to increase competitiveness.
- Investing in Software requires a mindset change.** In fact, Software companies typically invest around 24% of revenue in R&D, compared to 9% in hardware-focused companies.
- SaaS amplifies the need for R&D investment.** With over 29% of revenue invested in R&D compared to 17% of traditional delivery models, SaaS requires higher R&D investments since continuous innovation is crucial to retaining customers and justifying recurring payments. But the reward is high: predictable and stable revenue, even in economic downturns – and higher market valuation.
- The absolute R&D investment counts.** Companies must invest at a comparable absolute level to keep up with direct competition – if not more to maintain a competitive edge.

Introduction

Having added after-sales services as a second pillar to complement their hardware business, industrial companies are increasingly exploring a third pillar for future growth and profitability: value-adding application software - including offerings such as smart machine software, IIoT-enabled digital service platforms, cloud infrastructure and services, digital twins, predictive maintenance, and ML/ AI. The aspired benefits are clear: higher design quality, productivity, service efficiency, and asset performance – enhancing customer value while establishing recurring revenue streams. To succeed in their software activities, they must adopt the "software way" of allocating resources, both in focus and scale. As Satya Nadella from Microsoft said, "Every company is a Software company. You have to start thinking and operating like a digital company". But what does this actually mean?

Well, unlike traditional hardware-oriented businesses, Software companies heavily invest in R&D, among other best practices. This paper explores the strategic importance of R&D spending, its special role in application software development, its connection to growth and profitability, and why industrial companies should adopt a different approach to R&D investment in Software – aiming to build a successful business and evolve into true Technology companies. For this purpose, we analyzed 180 Tech and Software companies worldwide based on their public financial reports: The Tech companies are typically industrial players focused on hardware and services, with varying levels of software activity. In contrast, the Software companies are pure players, offering either plug-and-play products or more complex solutions requiring professional services.



Bespoke Application Software within a simplified technology stack

Software vs. Hardware – A different world?

Our benchmark shows three core differences in the P&L structures: First, Software companies enjoy almost 2 times higher Gross Margins – not surprisingly as the transition from physical to digital goods lowers COGS substantially. Second, despite higher operating expenditures, Software companies deliver on average almost double the Operating Profit. Third, Software companies allocate considerably more resources to R&D. On average, they spend 24% of their revenue on R&D, compared to 9% for Tech. Let's understand what is driving this behavior and why industry leaders should be aware.

24%

Software companies spend 24% of revenue on R&D, compared to 9% for Tech

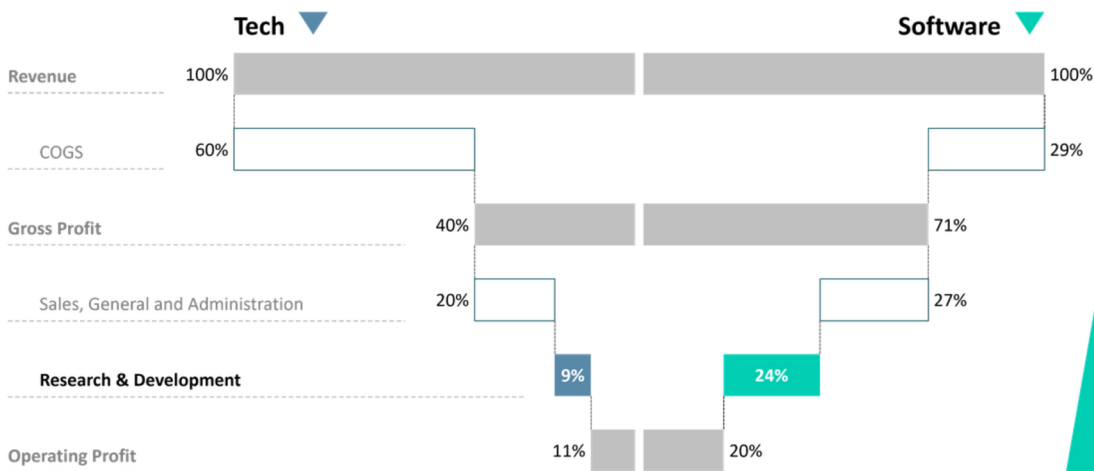


Exhibit 1

P&L comparison

Software firms typically enjoy higher gross profits – and spend almost 3x more on R&D on average than Tech

Median values per category, averaged over 5-year period, are displayed; median absolute deviation for R&D is ± 5% and ± 8% for Tech and Software, respectively

R&D and Growth – A bang for the buck?

Our analysis confirms a seemingly obvious, nevertheless fundamental truth: There is a very strong positive relationship of R&D expenditure and revenue. This is suggesting a great opportunity for industrial companies to grow, provided Software R&D investment is at the right level.

Hardware vs. Software R&D – A different game with different rules

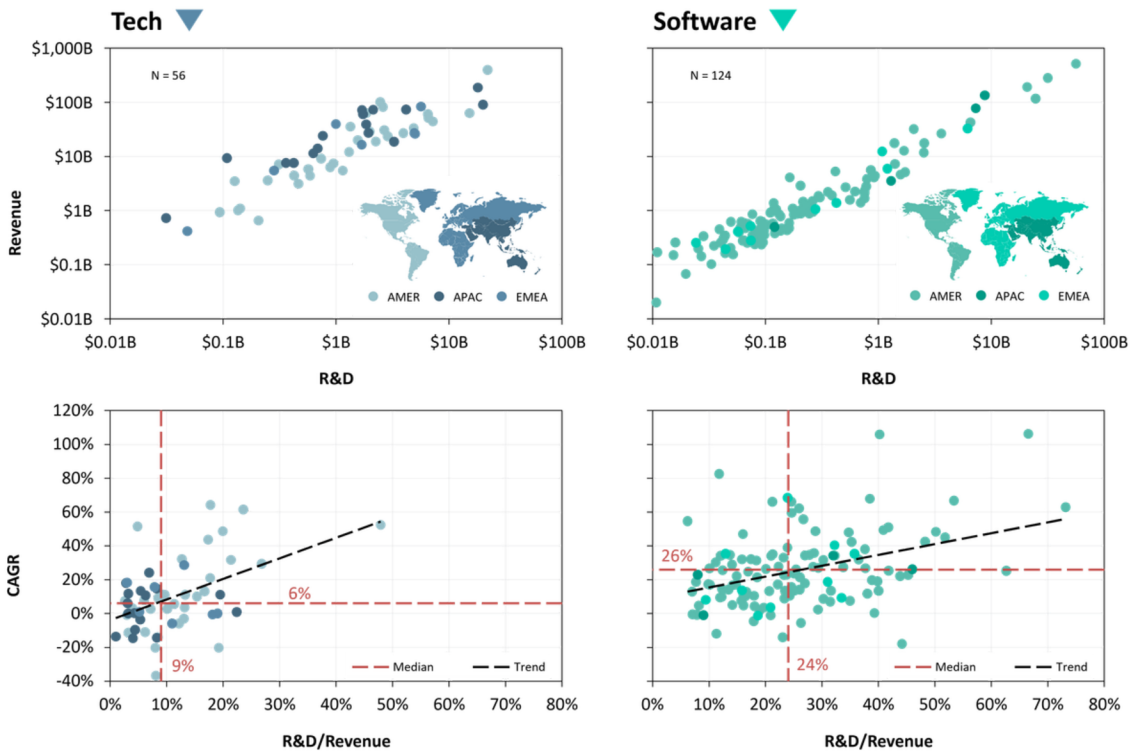


Exhibit 2

R&D vs. Growth

R&D fuels more than innovation – revenue levels and CAGR go hand in hand with R&D expenditures, and reach unmatched heights in Software

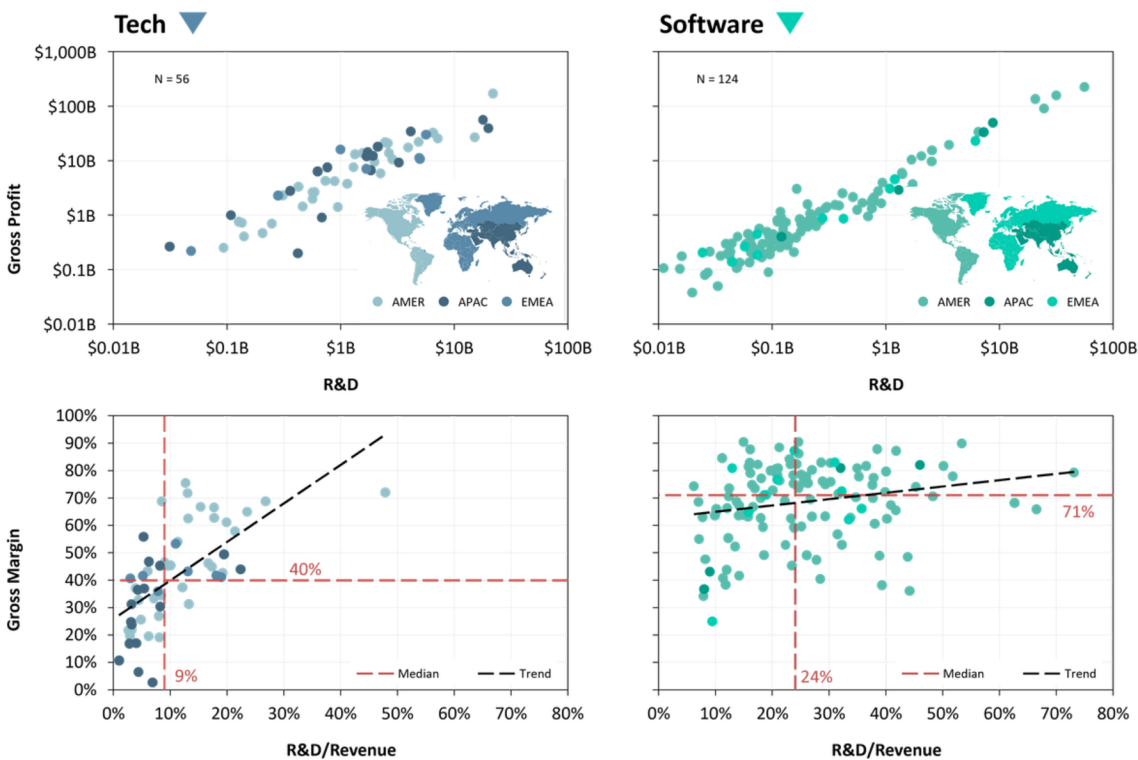
Statistically significant relationships ($p < 0.001$), very strong positive correlations ($r_s \sim 0.9$) for R&D and Revenue, medium positive correlations ($r_s \sim 0.4$) for R&D/Revenue and CAGR, evaluated over a 5-year period

Namely, Software companies invest almost 3 times as much of their revenue in R&D as Tech (24% vs. 9%). This disparity reflects a fundamental difference in the operating model – R&D in software isn't just an innovation driver; it effectively is the counterpart of manufacturing operations in the hardware industry. For industrial companies, this means traditional R&D budgeting approaches won't cut it for their application software investments. To stay competitive, industrial companies must recalibrate their spending priorities, treating application software R&D as the strategic and operational backbone of their growth ambitions. The rewards are high: Software companies show a 4 times stronger median growth compared to Tech (26% vs. 6%). In fact, Software companies maintain growth momentum well beyond 30% R&D spending.

This suggests an exceptional opportunity for industrial companies to accelerate growth through strategic R&D investment in Software. Of course, M&A and other activities may skew the picture, and typically Software companies grow aggressively to gain market share at the expense of profitability. Over time, though, R&D-induced growth may even compensate for the expenditure, creating a compelling case: when effectively allocated, increased R&D fuels Software company growth, much like expanding production capacity does in the industry. Cutting R&D, on the other hand, risks stalling momentum. And this is critical in Software: the speed of growth matters as market leaders are said to often enjoy massive economies of scale and pricing power, eventually leading to exceptional profitability. Let's take a closer look at our benchmark and see if this is true!

R&D and Return – Turning a profit or just in circles?

Indeed, Gross Profits are on average almost double in Software compared to Tech (71% vs. 40%), building the foundation for remarkably high Operating Profits that Software businesses typically deliver (20% vs. 11%). As a matter of fact, our benchmark shows that there is a very strong positive relationship between R&D expenditure and Gross Profit. Moreover, higher R&D investment can even be linked to higher Gross Margins according to the trendline.

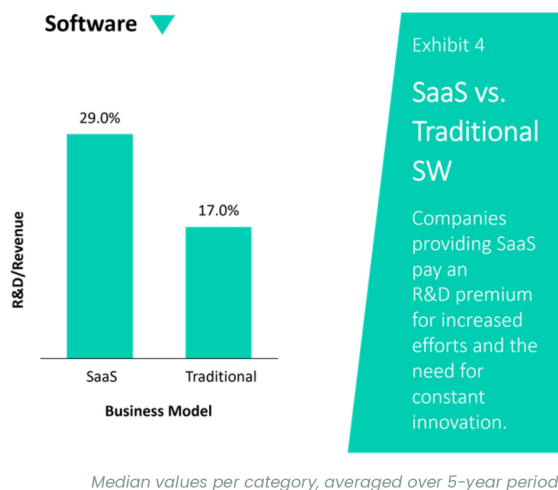


Statistically significant relationships ($p < 0.001..0.05$), very strong positive correlations ($r_s \sim 0.9$) for R&D and GP, high positive correlations to small ($r_s \sim 0.7..0.2$) for R&D/Revenue and GM, evaluated over a 5 year period

These findings are a direct consequence of the mechanisms prevailing in the software industry and independent of the company size: agile response to changing demands, fast go-to-market, rapid delivery, global distribution, and high scalability. Unlike hardware, software does not depend on time-consuming production ramp-ups and physical shipping. This environment leaves customers with little reason to choose anything but the best offering, driving market consolidation. Consequently, a few dominant players often emerge, as seen for instance in cloud computing (Google, Amazon, Microsoft), operating systems (Microsoft, Linux, Apple), or productivity software (Microsoft, Google) – gaining pricing power and benefiting from economies of scale.

Hence, for an industrial company to succeed in the software business, a fundamental shift in spending priorities is essential. Leaders should reinvest higher software Gross Profit into application software R&D to sustain competitive momentum. While the software R&D investment may seem high compared to machinery, electronics or general manufacturing, it is essential to success in Software. And again, the rewards are high: Tech companies show a steep improvement in Gross Margins in response to increased R&D, implying an extraordinary profit potential.

SaaS – A game changer in Software R&D?

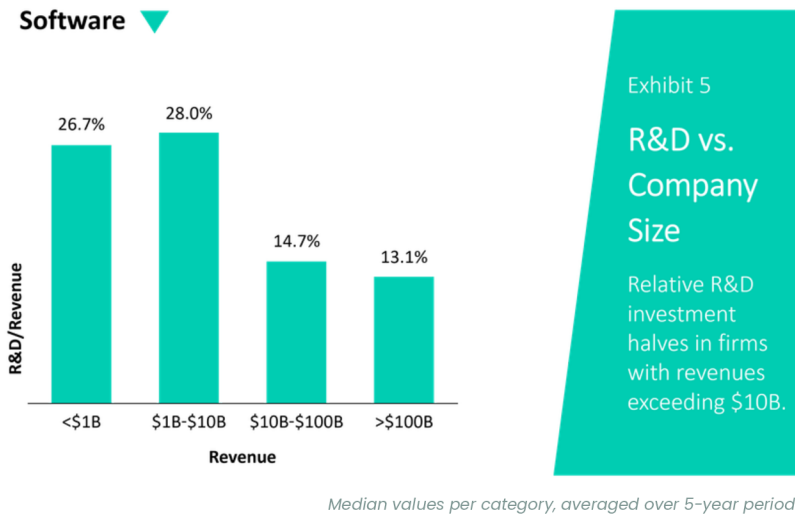


For companies pursuing a SaaS business model, our benchmark suggests a median R&D expenditure level of around 29% – notable 12 percentage points above traditional software delivery models with a median at around 17%. The SaaS R&D premium goes back to the need for continuous innovation to meet customer expectations and to justify recurring customer payments.

Additionally, cloud services – when offered – introduce ongoing infrastructure and higher life-cycle management investments in R&D. As a result, SaaS companies may maintain elevated R&D spending levels over time. While this may seem discouraging, investors typically focus more on the financial opportunity and reduced risk: The recurring revenue model provides a predictable and stable income based on existing contracts, especially in downcycles when customers reduce major investments faster than smaller recurring spends, while economies of scale ensure high profitability – typically resulting in higher valuation multiples than for industrial companies.

To stay competitive, industrial companies must recalibrate their spending priorities, treating application software R&D as the strategic and operational backbone of their growth ambitions.

Company Size – Deeper pockets, bigger leaps?



As a general rule, both Tech and Software companies decrease relative R&D expenditures as they grow. Beyond \$10B of revenue, relative median R&D investment is roughly 50% smaller than before. In fact, benchmarked Software firms with less than \$1B in annual revenue allocate typically around 27% to R&D on average, whereas companies with higher revenues up to several \$10B or more trend towards 15%.

A number of reasons such as the level of market position, process standardization, technology reuse, or automation may explain the behavior. But after all, a company must invest in R&D at a comparable absolute level to keep up with direct competition – if not more to maintain a competitive edge.

So what?

Our analysis shows that R&D is the backbone for success – it's the engine that drives innovation, differentiation, and profitable growth. Companies that strategically allocate resources to R&D show higher profitability and sustained expansion, with a strong positive correlation ($r_s = 0.9$). However, hardware-era benchmarks don't apply. Success in application software requires aligning R&D spending with software business norms: On average, software firms invest 24% of revenue in R&D, compared to 9% for Tech. But the rewards are high: Compared to Tech, Software companies enjoy, on average, higher growth (4x) and profitability (2x).

4x

Compared to Tech, Software companies enjoy, on average, higher growth (4x) and profitability (2x).

This reflects the fundamental part R&D plays in software business models, where it effectively takes the role of manufacturing operations. SaaS requires more R&D spending (29%) than traditional software models (17%) as continuous innovation is essential to maintaining customer retention and justifying recurring revenue models. To keep up with competition, though, comparable absolute R&D investment and pushing the right initiatives is vital.

Ultimately, competing in application software requires more than just shifting budget lines – it demands a fundamental mindset shift. Industrial companies that embrace this transformation will be best positioned to thrive in an increasingly software-defined world and become a successful Tech company. As Alan Kay, the famous computer pioneer, put it: “The best way to predict the future is to invent it.”

How much growth do you want?

Most Tech companies (73%) show moderate growth of up to 15%, whereas only a few (14%) benefit from CAGRs greater than 30%. The opposite is true for Software: Most Software companies (63%) show growth rates well beyond 15% with more than 1/3 enjoying a CAGR of more than 30%. In that sense, investing in Software R&D isn't just an expense – it's a catalyst for exceptional growth.

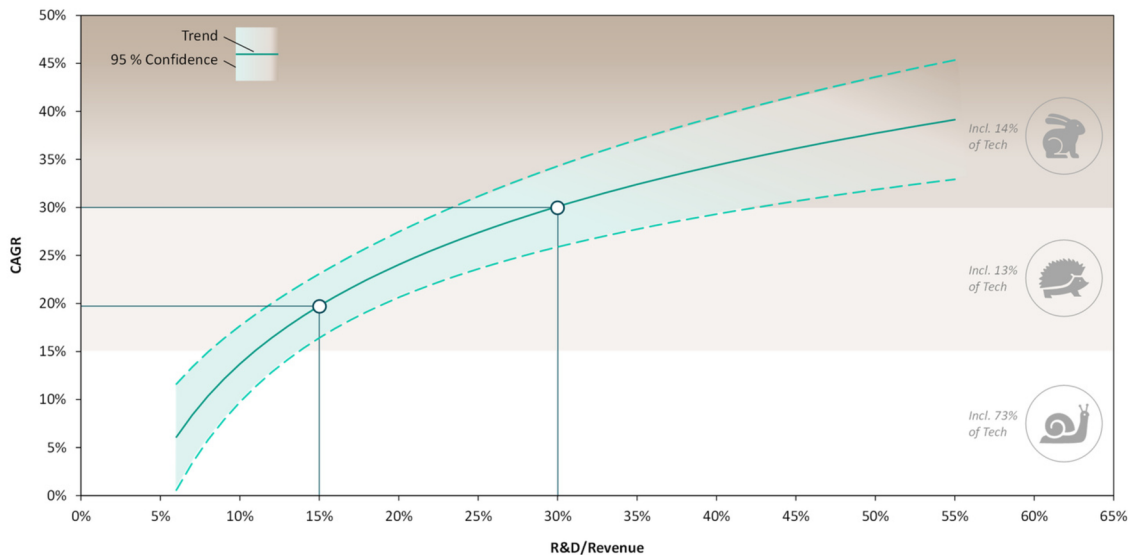


Exhibit 6

R&D Invest vs. Achievable Growth

Reinvesting 15% of revenue can drive 20% growth on average.

Our data indicates that industrial companies can expect an average growth of 20% of their Software business, provided they invest around 15% of their revenue in Software R&D. Those who double down may even achieve 30% growth.

How much growth do you want?

Global Content Leads



Dr. Michael Müller
Partner Germany
michael.mueller@cylad.com



Dr. Robert Schenk
Principal Germany
robert.schenk@cylad.com

Regional Contacts



Patrick Sage
Partner France
patrick.sage@cylad.com



Dr. Michael Preiss
Partner Switzerland
michael.preiss@cylad.com



Fabien Lasnaveres
Partner Canada
fabien.lasnaveres@cylad.com

About CYLAD

Independent consulting firm, CYLAD advises executives from industries and associated services to overcome performance, transformation and growth challenges. The firm combines Consulting Methodology with Senior Experts' experience for sustainable results for its clients of all sizes, offering a comprehensive range of services. CYLAD supports companies, especially in the Aerospace & Defence, Pharmaceutical/Health, Energy, Electronics and Transportation sectors.

CYLAD currently has 150 employees and 19 Partners across ten offices: Paris and Toulouse in France, Hamburg and Munich in Germany, Zurich (Pfäffikon SZ) and Geneva in Switzerland, Vienna in Austria, Adelaide and Sydney in Australia and Montreal in Canada.

www.cylad.com