WHITE PAPER

Pharma's digital transformation is about value—here's where to find it

Acting now could be worth $1.4-$2.2B in operating income for any big pharmaceutical company.

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Successful digital transformations depend on leaders' abilities to focus on value realization

In this analysis, we show how scaling seven common digital programs inside a typical top-10 pharma company could be worth $1.4-$2.2B in operating income over five years. Aside from the financial upsides, these programs offer significant opportunities for talent growth and strengthen the foundation on which future digital programs can be launched.

It's time to ask everyone to be involved and make opting out the exception

Pharma's digital leaders have already shown successes with high-value digital experiments, but the operational breakthroughs they're making are not spreading to larger portfolios of business processes, across therapies or markets, and they're often not keeping pace with customers who are innovating faster than they are.

While pharma leaders have proven what's possible, too often what's missing is a compelling value story for the enterprise and a commitment to focus on scaling-up:

- Consider that only a fraction of the 58,000 clinical trials registered in the U.S. in 2023 are designed to reduce the time from asset discovery to patient benefit.
- In supply chain and manufacturing, companies have only marginally embraced the next industrial revolution to prepare for the complexity of manufacturing advanced therapies including CAR-T, messenger RNA (mRNA) and antibody-drug conjugates.
- In commercial groups, many organizations are just getting started with capturing customer preferences and then using algorithms to understand which combinations of commercial and medical information can deliver the right experiences at scale.

What do we mean by scaling digital success?

There are many ways to scale digital programs to maximize enterprise value. These include increasing adoption rates across users, brands, therapeutic categories or geographies and uncovering opportunities to re-use durable digital capabilities across use cases.

Digital programs to scale now

Based on extensive digital transformation experience, ZS has prioritized seven programs that have proven themselves to be top value-creators for the pharmaceutical industry today. They're the operational powerhouses that can readily scale across large multinational organizations, supported by modern technology, data, and AI and analytics foundations.

As we look ahead, emerging technologies that can be value multipliers, such as the use of generative AI affect these areas, too. However, when it comes to operational capabilities, the most practical and actionable approach remains understanding the core foundations of the seven to scale, why they already work and what you gain by focusing on them.

FIGURE 1: THE 7 TO SCALE

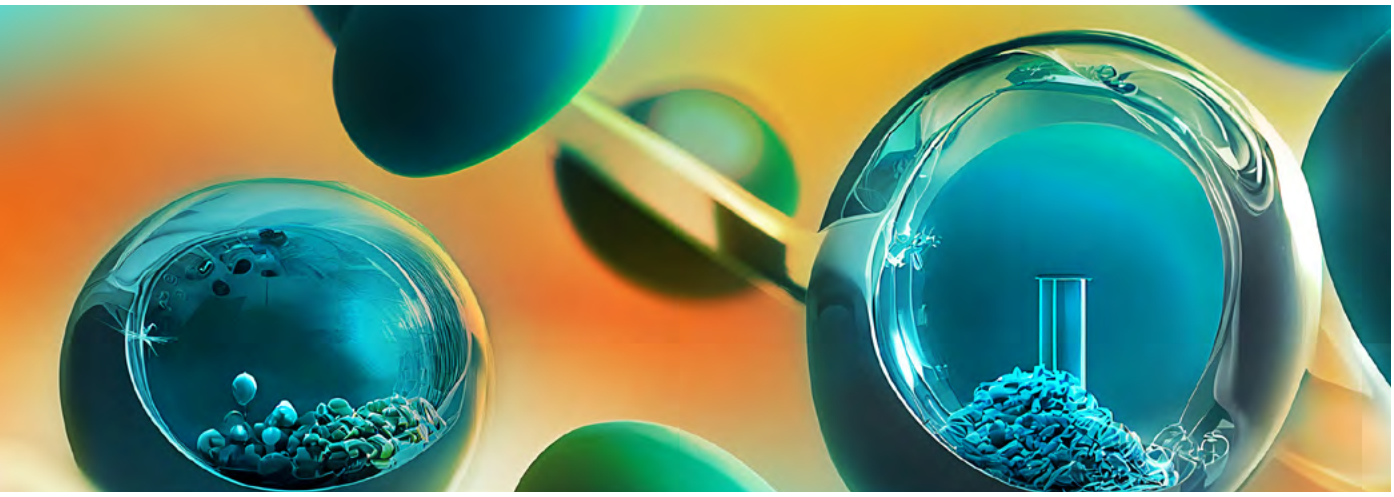
Essential digital programs that create meaningful value

Clinical development	Supply chain and manufacturing	Commercial engagement
1. Data-optimized clinical trial design	3. AI-driven yield optimization	6. Digital and field orchestration and precision engagement
2. Digital health-enabled trial execution	4. Data-driven scrap reduction	7. Hyper-personalized content marketing
	5. AI-optimized planning and scheduling	

Digital foundation

Modern technology | Connected data ecosystem | Intelligent analytics | Operating model | Digital talent and upskilling

Source: ZS



Clinical development

1. Data-optimized clinical trial design involves using AI and analytics to optimize various aspects of the trial to accelerate development, such as recommending the removal of visits and assessments; evaluating study criteria versus RWD; and selecting countries, sites and investigators based on opportunity. It also aims to improve the overall patient and site experience and reduce patient drop-off as part of the design by minimizing burden and complexity and connecting stakeholder experience to trial speed and quality.

2. Digital health-enabled trial execution involves running clinical trials using digital health tools, decentralized methods and remote data collection. When used in combination, these digitally enabled approaches can reduce study completion times, improve and diversify patient recruitment and retention and reduce implementation costs.

Supply chain and manufacturing

3. AI-driven yield optimization uses AI and machine learning analysis to optimize processes and parameters that increase yields across manufacturing plants.

4. Data-driven scrap reduction reduces unplanned scrap of raw materials and finished goods that can be avoided through data-driven analyses.

5. AI-optimized planning and scheduling improves manufacturing production scheduling to increase overall run rates and open manufacturing capacity.

Commercial engagement

6. Digital and field orchestration and precision engagement involves shifting to an omnichannel model for field and marketing. In this model, field and marketing teams interact with healthcare providers (HCPs) and integrated delivery networks based on omnichannel orchestration and dynamic targeting algorithms. This engagement drives metrics for improved customer experiences, better access to those customers and, ultimately, product revenue increases.

7. Hyper-personalized content marketing uses AI to support the creation optimization and assembly of hyper-personalized content for the individualized preferences of HCPs and patients, thereby increasing relevance of pharma engagement with their customers and driving toward greater impact.

The value potential

To show the value potential of scaling these programs, we've estimated the cost savings and margin upside potential using a base case. The base case is a **diversified top-10 global pharmaceutical company with median digital maturity,** compared to a similar industry peer group.

Inputs for our estimates include:

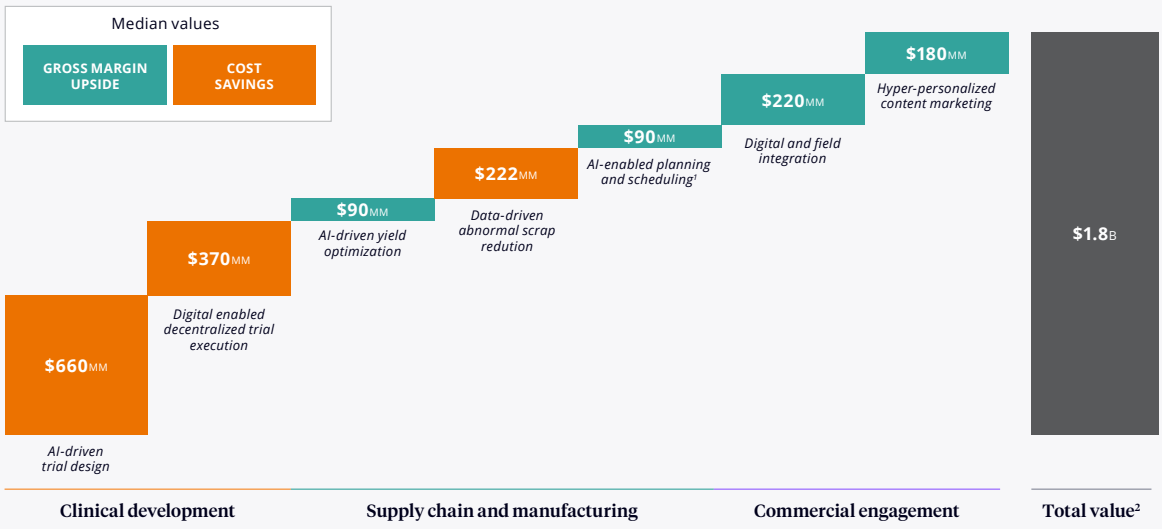
- Publicly available information, including the company's 2022 10-K and information shared by the company in earnings calls and on the company's corporate website.
- Value estimates for cost savings and gross margin upside. These inputs are based on industry benchmarks and ZS proprietary data from our client work. Units include clinical trials, manufacturing sites, therapy areas and products.
- Reasonable scenarios. For example, our baseline for cost savings in clinical does not factor in upside potential for speeding a product's time to market, as those timeframes vary and may face other uncertainties.

To illustrate, if our base case has 120 active phase 2 and phase 3 clinical trials eligible for optimization, we can estimate the cost savings potential across all 120 if each of these trials were digitalized to today's standards.

Acting on all seven programs could be worth $1.4-$2.2B in operating income in five years for our base case company. Similar companies can expect similar ranges of value potential. Figure 2 shows the median value for our base case across a five-year window at $1.8B.

FIGURE 2: MID-RANGE VALUATION

Value across 5 years for a top-10 pharmaceutical company



Source: ZS

1. One-time expense savings in the first year. 2. The average total value is expense savings plus additional gross margin contribution over five years. Not an NPV calculation: does not account for costs of implementing digital solutions; cash flows are not discounted.

What the 7 to scale means in practice

In practice, scaling these programs requires a focus on how teams will work differently and how to plan for enterprise value from the start. The sections that follow can help you test your understanding of these capabilities and where they may be evolving next.

Clinical development

The goals for the programs to scale in **clinical development** are to reduce study completion times, improve and diversify patient recruitment and retention and lower costs to bring products to market.

A good test of your company's ability to create value here is to ask how well your teams can:

- **Reveal the flaws of past studies to remove future costs and delays.** A recent focus on unifying underlying operational data has been helping sponsors understand the cause-and-effect relationships of the choices made in study designs. Armed with easy-to-query data, researchers can conduct retrospectives to answer questions such as the upstream causes of amendments, which sites have consistently better track records for recruitment or how budget parameters should inform design decisions.
- **Make it easier for participants to get and stay enrolled by reducing the burden of participation.** Sponsors have traditionally focused solely on recruitment in clinical trials. And while recruiting participants can be costly ($6,533 per person on average), the average cost to replace a participant if one is lost to non-compliance is three times greater. Using data and digital innovations, sponsors can identify how to provide a better experience, lower the overall patient burden and have fewer dropouts. This capability is a key differentiator for any team working toward more inclusive and diverse participation in clinical trials and patient engagement.
- **Link the use of digital health and decentralized tools to value metrics.** These tools allow patients to complete steps virtually throughout the recruiting, participation and closeout stages. Early estimates have quantified today's expected return for using digital health and decentralized tools in mid- and late-stage trials at a 21% and 26% reduction in trial duration, respectively. Large companies have proven it can work: In 2016, Sanofi used digital health and decentralized tools for a 56% faster recruitment rate in a diabetes phase IV trial and Novartis enabled a 30% higher patient retention rate in a 2018 musculoskeletal study.

Case example: How design scientists tackled operational burden and complexity for $109 million in cost savings across 5 trials

This large global pharmaceutical company tasked their design scientists and ZS with creating a clinical trial analytics capability. Its purpose was to analyze elements of the protocol that increased the risk of amendments, burden and complexity. They wanted to make much more informed decisions during the planning phase to optimize outcomes based on comparisons with similar trials.

During initial testing on a group of pre-study design trials, the team used the insights gained to modify the designs of five trials. Their results? A significant reduction in operational burden and an estimated cost savings exceeding $109 million. The team is now working on expanding this analytics capability to be used in every clinical trial.

"Knowing upfront which parts of a clinical study are primed to have digital interventions or decentralized replacements is key to moving faster with less burden on sites and patients. These insights also help teams invest in the right combinations of emerging technologies and channels."

Mike Martin, ZS's clinical development practice leader

"By collecting site feedback, we've been able to optimize our trial operations significantly. We've found that when we address feedback to reduce administrative burdens, with even small improvements, such as implementing single sign-on for users, we can increase customer satisfaction and improve quality and processing times. We've also expanded our solution's sophistication by incorporating the best times to perform monitoring visits at our sites using AI/ML recommendations, which we've scaled for all our sites and users. These results help us stay focused on continuous improvement."

Eileen Doherty, VP Enabling Business Information Solutions, Clinical Operations, Janssen

"When we think about the behavioral and mindset shifts that need to happen for drug discovery, everything comes back to solving the problem of data heterogeneity. If data is low quality or there's insufficient data to represent diverse populations, then the promise of personalized medicine will never be realized and only worsen inequities. This exists in basic research as well as clinical settings—high quality, diverse and representative data is necessary. "

Naheed Kurji, President, Recursion Canada and former President and CEO of Cyclica

Where to look next: Clinical value

Where will teams drive meaningful value next in their digital programs? Over the next three years, we expect leaders to:

- **Standardize more trial-related documentation and increasingly automate manual tasks.** This allows organizations to achieve seamless and error-free data exchange for trial operations. Without this foundation, other goals for participant retention, recruitment and diversity will endure as pain points. The nonprofit consortium TransCelerate is focusing efforts here so that all parts of a clinical trial can be more easily studied, shared and explained.
- **Link the outcomes of clinical trials with the use of digital health tools.** Opportunities here are on three fronts: patient engagement, clinical measurements (such as generating evidence through digital biomarkers and digital endpoints) and health outcomes (via the use of digital therapeutics or software as a medical device).
- **Expand the omics environment to support research and clinical value.** Soon, both data and tools in the omics environment will enable researchers in precision medicine to gain valuable insights into the root causes of diseases for patients who are well-represented in the available data. However, for value to be equitable, companies must expand the data pipeline to encompass more diverse populations; otherwise, the result will be even greater health disparities worldwide.

II Supply chain and manufacturing

Today's best opportunities for scaling value exist in manufacturing and they are steps along the journey to optimize operations to support frequent nano and micro product launches—and eventually adopt autonomous manufacturing. All this work supports one goal: getting the right medicines to the right patients.

A good test of your company's ability to create meaningful value today is to ask how well your teams can:

- **Use data proactively to improve output across manufacturing plants.** While manufacturing has always produced massive amounts of data, this data has primarily been used to resolve issues for single sites retroactively. Taking an approach to optimize yield on a larger scale across manufacturing plants and use predictive analysis can lead to increased revenues, minimize inventory stock-outs and achieve overall cost reductions.
- **Reduce unplanned scrapping of raw materials.** Upstream decisions that lead to the scrapping of raw materials can have a significant impact on the bottom line, yet this cause-and-effect relationship often goes unanalyzed. For example, procurement patterns such as long lead times often force companies to purchase raw materials years in advance based on the best-known supply plan at that point in time. As supply plans change, the procured materials of cancelled products are often scrapped. Focusing analytics attention on why supply plans change, rather than how to reduce the final scrap figure, can dramatically shift the value equation.
- **Maximize production schedules.** Effective production scheduling can offer multiple benefits to manufacturing, including maximizing plant utilization, reducing downtime and, ultimately, increasing the run rate to open up additional manufacturing capacity. But plant utilization is often constrained by various subdimensions, such as equipment or personnel availability, making it essential to utilize digital tools to integrate all these aspects and create a unified model for efficient manufacturing planning.

Case example: How to increase operational resiliency and efficiency through a digital control tower

A large drug manufacturer asked ZS to help improve real-time visibility into their production from the shop floor to the executive leadership levels. To meet the goal, we developed an integrated control tower system using walk-by screens on the shop floor: 75" TV monitors that display real-time insights into key performance indicators for production and equipment.

We then developed a sister application for remote teams to track data from more than 10 sources in a live dashboard. The manufacturer is now working to expand the delivery and scope of their digital control tower—from their first final drug product plant to drug substance plants and beyond.

"There's a definite cost to supply disruptions, so having real-time external information improves our ability to make decisions in the moment. Product launches are much more frequent and complex, too, so we must be able to detect and act on information as fast as possible to adapt and avoid delays."

Ongun Saracbasi, Head of Supply Chain Excellence at UCB

"Right now, the focus across supply chain and manufacturing is ensuring that products reach patients. The digitalization will avoid stock-outs and enable patient access to drugs. This will also enable getting ready to manufacture more complex products, including CAR-T and mRNA therapies. Autonomous and continuous manufacturing will help them with the complexity and speed needed for those, all while they do more with less—less waste, less footprint and less cost."

Anshul Agarwal, ZS's global supply chain and manufacturing leader

Where to look next: Supply chain and manufacturing value

Over the next three years, we expect leaders will tie several more efforts to meaningful value. Here, we've been helping our clients to:

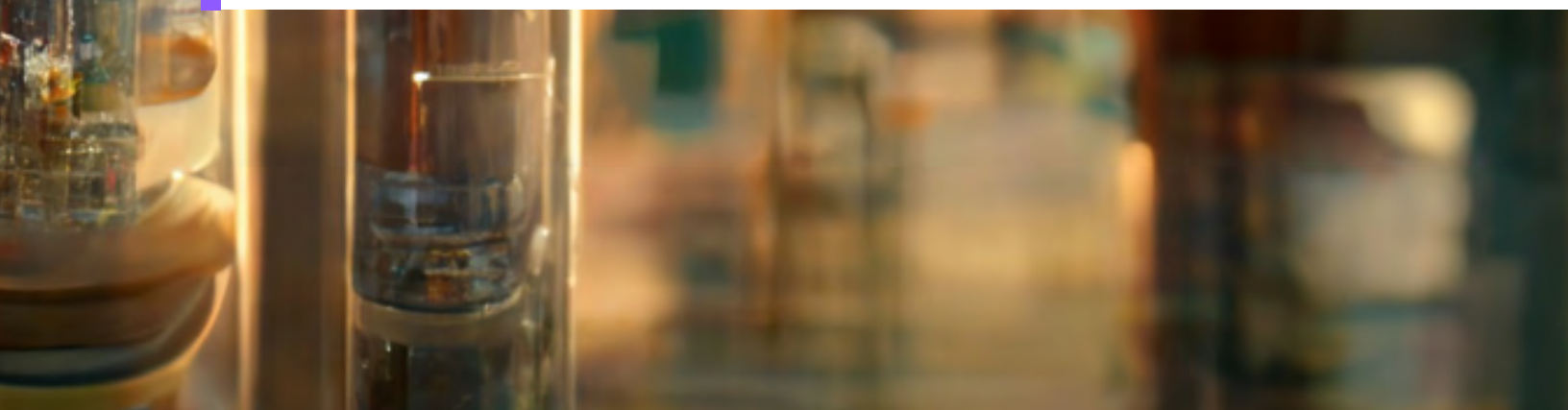
- **Test decisions through digital twins of real supply chains.** Virtual replicas or digital twins help companies create their real-world supply chains digitally. Planners use the virtual copy to pressure test the implications of redesigns quickly before making costly decisions.
- **Integrate more external data sources within company systems to increase responsiveness.** Application programming interfaces (APIs) make integrating external data into enterprise systems much easier, so operations teams can use it in dynamic planning. They can respond to real-time alerts for regulatory changes, severe weather, day-to-day price fluctuations, blocked transportation routes and more. This also extends beyond internal supply chains to interconnecting with partners such as contract manufacturing organizations and third-party logistics providers who yield equally important value across the supply chain.
- **Provide auditable data for achieving net-zero healthcare.** Scope 3 emissions along the supply chain are critically important for the consortium of global pharmaceutical companies pledging to accelerate net-zero healthcare. As a result, companies who make progress reporting emissions and using this information to drive them down further solidify their right to operate in many countries.


III
Commercial

For commercial engagement, field teams know that healthcare providers are two-thirds as likely to engage with pharmaceutical reps compared to a decade ago, as tracked by ZS's AccessMonitor and AffinityMonitor™. The data shows the importance of remaining relevant through more personalized, engaging experiences. Increasing relevance directly correlates with sales.

Today's test for scaling value here, depends on how well commercial teams can:

- **Enable the field force and marketing team with a true picture of each customer's needs.** Digital leaders equip the company with insights about customers and suggestions for actions that would benefit everyone. They use data and artificial intelligence to facilitate collaboration across sales roles and digital channels, raising productivity, sometimes by as much as 40%.
- **Build personalization capabilities.** Personalization is not one activity, but several activities that build for value, including data analysis to uncover preferences, channel innovation, omnichannel orchestration of marketing and sales touchpoints and the development, optimization and delivery of hyper-personalized content. In our work with pharma, personalization activities have shown a clear margin upside—up to 20% of sales.
- **Mine for more value-added insights.** Research shows that the disconnect between doctors and patients is stark. Pharma can help close these gaps by looking for more value-added insights in patient-level data, such as never starts or those who stop their treatments mid-flight. These become powerful, tailored messages for HCPs about their specific patient population.



Case example: How a global organization used automated and algorithmic next best actions to drive sales lift between 5%-10% across their portfolio brands

High-growth expectations drove one large pharma organization to realize that the siloed nature of their sales and marketing teams was leading to inconsistent experiences for more than 350,000 healthcare providers. Without action, their growth expectations could be hampered due to advanced targeting capabilities from competitors.

The team's goal was to learn from all customer interactions by combining data from sales and marketing in a cross-functional way. They started with a unified data platform and then added machine learning algorithms to provide thousands of sales reps with next best actions to enhance provider interactions. So far, the team has attributed a 5%-10% sales lift across their portfolio brands to the field's use of next best actions alone.

The program has since been expanded globally and regional teams now calibrate and optimize marketing and sales strategies using these capabilities, too. The self-service platform gives leaders a comprehensive view of customer interactions and enables HCP engagement and sales optimization through next best actions across global markets: U.S., Latin America, Asia, Africa, the Middle East, Australia and New Zealand.

"The change over the years is incredible. Before, you would go out to have a conversation with a physician and just hope you picked the right topic. Now, claims data can reveal unmet needs, and you can have much more relevant conversations in a compliant way. This has allowed us to move from organizing around large segments to using hyper-personalization."

Dr. Kimberly A. Moran, SVP & Head of U.S. Rare Diseases, UCB

"We find many companies are still far too conservative in their ambitions for healthcare provider personalization. We've scaled next best action across 15 countries for nine brands in under 18 months. With the right leadership support, commitment and use of right platforms, companies can scale personalized next best actions across brands very, very quickly."

Omer Hancer, ZS's global customer experience AI and analytics leader

Where to look next: Commercial value

Today's commercial engagement capabilities are well suited for reuse in new or innovative ways. Therefore, we expect that pharma will begin to use personalization capabilities to help **ensure the health outcomes found in controlled clinical trials are preserved in clinical practice.**

One goal is to use data to reduce the average time to diagnosis for a rare disease significantly, which can often take four to five years—and in some cases over a decade. Solutions here include better digital tools for matching people struggling with a rare condition to diagnostic support such as easy-to-administer genetic testing and algorithmic solutions that comb through patient-level data. Innovators will make it easier to find trusted providers and they'll create personalized experiences during remote therapy, customized content, other virtual support or therapeutic devices.

Tips for working together to maximize digital value at scale

Scaling value with digital transformation leaders requires everyone working together, yet finding and sustaining support from business; enterprise IT; and data, AI and analytics leaders is a challenge and will remain so. All leaders can work toward common goals:

1. **Develop a robust digital portfolio management capability.** Plan for scale from the start and use reasonable estimates of value for your stretch targets. Measure and communicate progress regularly and ensure your programs account for ongoing improvement.
2. **Ensure enterprise-level data, technology and AI investments are in sync** and consider prioritizing programs that can be used to advance organizational capabilities in more than one way.
3. **Do not let data, technology and AI capabilities outpace the ability of the team to consume them.** Carefully watch adoption and plan to use a portion of investments for upskilling. This mindset helps you maintain your focus on realizing sustained value with capabilities that haven't fully scaled, rather than immediately transitioning to the next entirely new solution build.
4. **Recognize the significance of the change.** Work to understand cultural or organizational barriers to change, address fears of disruption and reward cross-functional teaming.
5. **Ensure teams sustain energy until they reach the goal.** To achieve bold ambitions, it's important to reward each team until everyone gets to the destination. Focus as much energy on the teams working toward the end goal as you did on celebrating the initial innovation.

Methodology

In August 2023, ZS conducted an in-depth assessment of a diversified pharmaceutical company to quantify the potential value of scaling seven common digital programs. We used publicly available data, including the 2022 10-K and information shared by the company in earnings calls and on the corporate website, as well as government sources of data. To identify potential value, we assumed a medium level of digital maturity for each of the seven programs. We calculated the potential for gross margin upside and cost savings at 2022 benchmarks based on the number of known clinical trials in progress (ClinicalTrials.gov), manufacturing sites and annual sales. The potential value estimates total expense savings plus added gross margin contribution over five years. The potential value is not an NPV calculation. It does not account for the costs of implementing digital solutions; cash flows are not discounted.

About the authors

Jessica Jarvis is the global digital transformation lead at ZS. She holds a passion for innovation and finding value at the intersection of customer needs, AI and technology. She's helped dozens of the top global pharmaceutical, biotech and healthcare companies develop and implement sales and marketing strategies, leverage digital health solutions, effectively use real-world data and better connect technology applications to real business need across the enterprise (R&D, manufacturing, medical and commercial). Today she is extending those services to help organizations determine how to realize value from the next wave of innovation with generative AI.

Anshul Agarwal leads ZS's global supply chain and manufacturing practice. He's helped more than 30 clients transform their supply chain and manufacturing operations and achieve excellence using data, AI and technology. He advises senior leadership teams at both Fortune 500 and emerging life sciences companies on topics such as business capability building, transformation and enabling analytics to drive commercial success.

Daniel Blessing is an associate principal in ZS's strategy and transformation practice, focusing on digital strategy and value creation in the healthcare industry. He has worked broadly across life sciences and medtech in the U.S. and APAC. His primary areas of expertise are business model evaluation, marketing and competitive strategy, digital strategy and capabilities, and financial modeling and valuation.

Omer Hancer leads ZS's customer-centric marketing and digital, analytics and AI solution areas, including next best action and omnichannel orchestration. He helps senior leaders scale programs in sales, marketing and medical analytics and operations. His work includes descriptive, predictive and prescriptive analysis, brand planning and omnichannel resource optimization for product portfolios.

Mike Martin leads ZS's clinical development practice area and helps clients develop effective and safe products to improve patient health worldwide. Mike has expertise across clinical development with a focus in study design, planning and patient and site experience. Outside of clinical development, he has also worked extensively within medical affairs and helped to bridge R&D to commercial through portfolio strategy.

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About ZS

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