



The University of Manchester

## **MCEL30012 Advanced Technology Enterprise**

### **Redefining SAP Core Strategy to cope with Recent Cloud Migration Challenges**

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## 1. Introduction

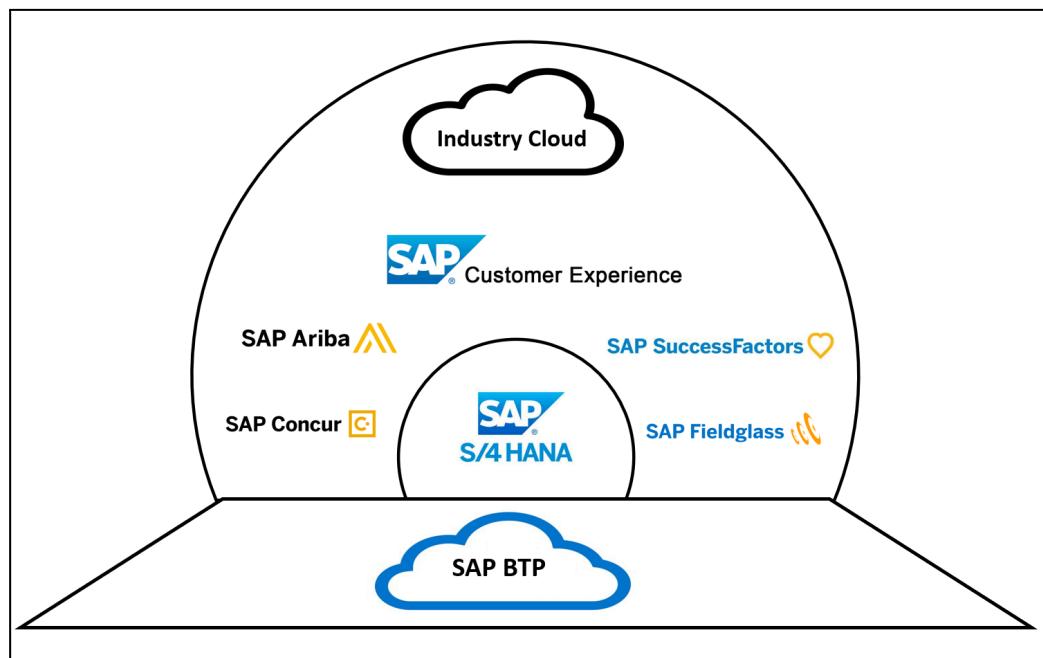
### 1.1. Background of SAP Limited

In this paper, we will be analysing SAP Limited (Systems, Applications & Products in Data Processing), a global software company leading in enterprise application software. SAP core business model focuses on delivering cloud solutions catered to organisation's business needs.

### 1.2. Core Products and Services

#### 1.2.1. Cloud and Software Solutions Suite

Among SAP's suite of software solutions for business intelligence (Figure 1), **SAP S/4HANA Cloud** is their recent core product, providing software capabilities for finance, end-to-end business management tools infused with AI capabilities on the cloud targeted at transforming customer's business models.



**Figure 1: SAP Core Product Offerings**

### 1.2.2. Differentiated Solutions tailored to Varying Requirements

SAP has two key offerings to cater to different customer objectives and requirements (Table 2):

- **RISE with SAP** aims to accelerate customer's digital transformation journey by assisting them with migrating ERP systems to the cloud.
- **GROW with SAP** aims to enable midmarket companies to go-live with ERP solutions within a short period of time.

Aspect	GROW with SAP	RISE with SAP
<b>Target Audience</b>	Mid-sized companies, novice cloud ERP users.	Larger companies, existing SAP users with complex needs.
<b>Focus</b>	Straightforward, preconfigured ERP solution.	Customized, flexible bundle of services for ERP adoption.
<b>Nature of Solution</b>	Predictable, structured, quick implementation.	Tailored, personalized, comprehensive ERP solution.
<b>Goal</b>	Quick and efficient setup of SAP S/4HANA Cloud.	Optimize ERP capabilities, growth, and industry-specific best practices.
<b>Core System</b>	SAP S/4HANA Cloud Public Edition	SAP S/4HANA Cloud
<b>System Deployment</b>	Primarily cloud-based, preconfigured for rapid implementation	Hybrid and Two-Tier Deployment (for large enterprises)
<b>Configuration</b>	Streamlined, ready-to-go with minimal customization	Customizable to specific business needs and complexities
<b>Target Deployment Scale</b>	Designed for mid-sized businesses and novice cloud ERP users	Suitable for large-scale operations and existing SAP users
<b>System Landscape</b>	Similar three-system landscape: development, testing, production	Typically involves development, testing, and production environments

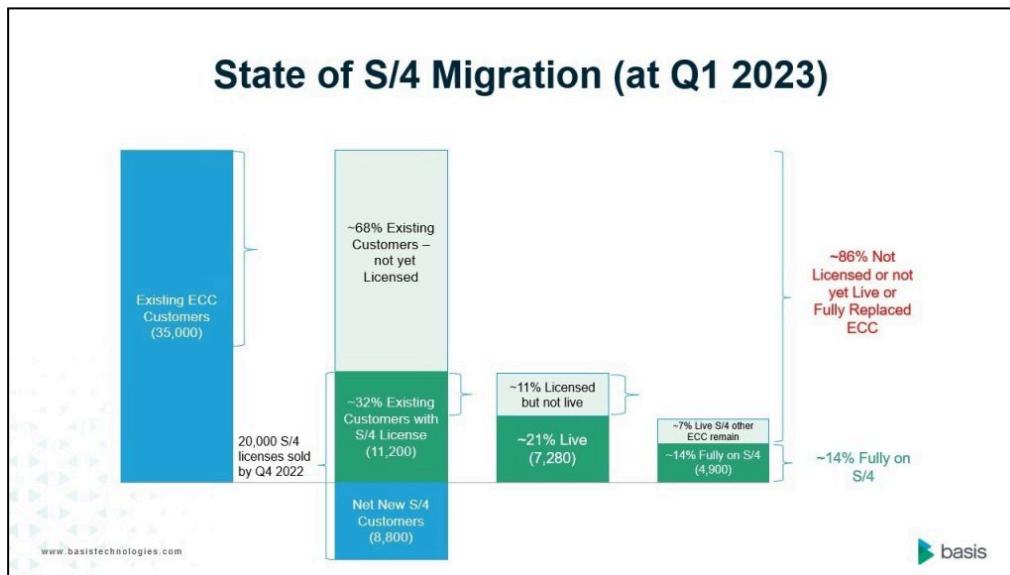
**SCM BOX**  
UNBOX YOUR POTENTIAL

**Table 2: Comparison between RISE with SAP and GROW with SAP**

**(SCM Box, 2024)**

### 1.2.3. ERP Migration towards S/4HANA

In Q1 2018, SAP initiated a migration from their traditional on-premise ERP Central Component (ECC) solution to their new S/4HANA cloud ERP solution, with operational support for ECC ending in 2027 (SAP, 2023). However, **68% have yet to sign a licence for S/4HANA** and only **14% of existing customers have completed migration** towards S/4HANA and (Figure 3).



**Figure 3: State of S/4HANA Migration at Q1 2023 (Lees, 2023)**

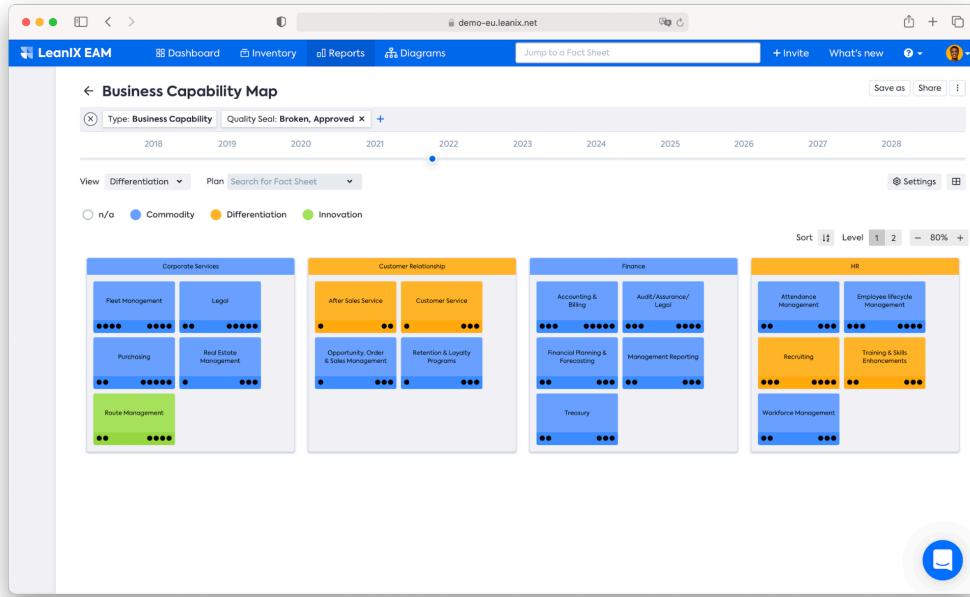
### 1.3. Recent Developments

#### 1.3.1. Advancements in SAP Business AI

SAP released **Joule**, a co-pilot built into their solutions in September 2023, **SAP Build Code**, an AI-powered solution to enhance coders' productivity in November 2023, and **Cloud ERP Suite**, to re-focus towards packaged suite deals and flexible consumption models in December 2023.

#### 1.3.2. Acquisition of LeanIX

On November 8, 2023, SAP completed the acquisition of LeanIX, a market leader for **enterprise architecture management (EAM)**, a software-as-a-service solution to aid companies visually assess and manage IT architecture transitions, with the aim of integrating AI to facilitate ease of navigation and efficient IT transformation (Figure 4).



**Figure 4: Use case of LeanIX EAM platform (LeanIX, 2024)**

### 1.3.3. New Collaborations and Joint Ventures

**IBM Collaboration (January 11, 2024).** IBM is working with SAP to create new AI solutions by embedding IBM's WatsonAI into SAP solutions for consumer packaged goods, and retail industries to automate order settlement, optimise assortments and enhance transport operations management (IBM, 2024).

**Collibra AI Governance Partnership (February 29, 2024).** SAP partnered with Collibra to build tailored integrations between Collibra AI Governance and SAP Datasphere to allow enterprises to track and manage AI developmental efforts, increasing transparency and accountability of AI's usage and ensuring adherence towards regulatory, compliance and privacy policies.

**SAP - Accenture Joint Venture (March 8, 2024).** Leveraging on Accenture's expertise in business process transformation, SAP seeks to advance their Integrated Business Planning for Supply Chain (SAP IBP) by aiming to create sustainable solutions to enable decarbonization of organisations' supply chains (Accenture, 2023).

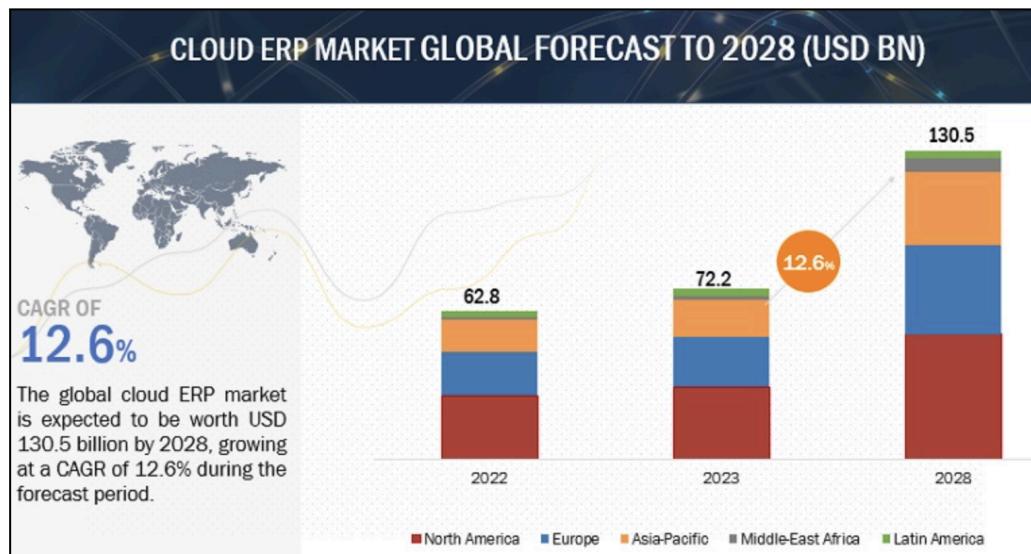


**Figure 5: Vision of SAP-Accenture Venture (SAP News Centre et al., 2021)**

## 1.4. Competitive Landscape

### 1.4.1. Market Outlook

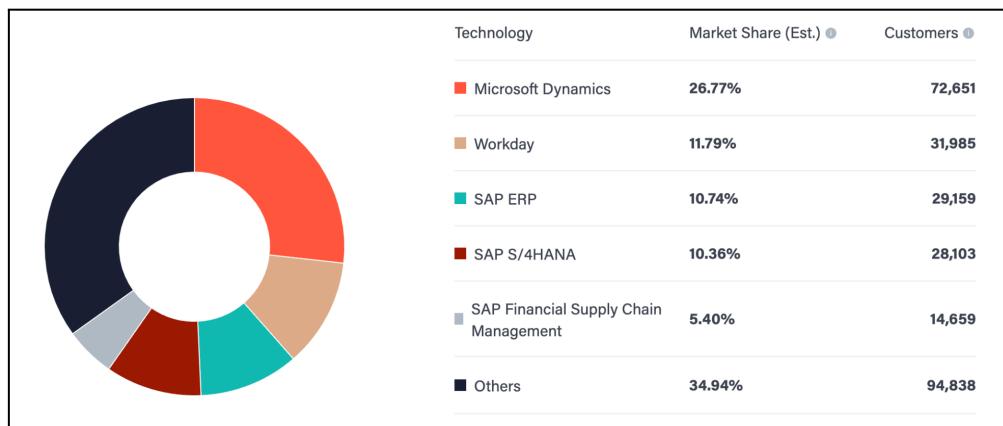
Cloud-based ERP market size is forecasted to grow at a **CAGR of 12.6%** (Figure 6), reaching USD 130.5 billion by 2028 which presents a significant market opportunity for SAP, attributed to recent developments in artificial intelligence (Markets and markets, 2023).



**Figure 6: Global forecast of Cloud-ERP market between 2022 - 2028  
(Markets and markets, 2023)**

#### 1.4.2. Main Competitors

SAP faces strong competition from other enterprise software vendors such as **Microsoft, Oracle & Salesforce** which develop similar products like ERP and CRM tools. In the market for ERP tools, SAP holds 10.74% market share, with its key competitors being **Microsoft Dynamics and Workday** (Figure 7). We will be using these competitors for our subsequent analysis.



**Figure 7: Market share breakdown of ERP tools in 2024 (6Sense, 2024)**

### 1.4.3. Comparison with Microsoft Dynamics 365

SAP 4/S/hana offers more specialised ERP solutions with integrated intelligent automation to facilitate business operations analytics, contrasting from Microsoft Dynamics which focuses more on offering ease of usage and integrations, better productivity and embedded analytics to its users (Table 8).

SAP 4/S/hana	Microsoft Dynamics
<b>Business Process Automation.</b> Integrations with intelligent automation, artificial intelligence and robot process automation (RPA).	<b>Embedded AI &amp; Machine Learning.</b> Actionable insights to optimise decisions and processes.
<b>Pre-configured industry solutions.</b> Accelerate implementation of ERP solutions with built-in domain expertise.	<b>No-code customization.</b> Users are able to adapt the solution to support changing business needs.
<b>Global ecosystem of resources.</b> Provides a vast partner network of customer support and co-innovation to customers.	<b>Native mobile capabilities across devices.</b> Increased productivity through seamless access to data and workflows cross-platforms.
<b>Focus on large enterprises</b>	<b>Focus on medium enterprises</b>

**Table 8: Key Differences between SAP 4/S/hana and Microsoft Dynamics**  
**(Technology Evaluation Centers, 2024)**

## 2. Financial Analysis

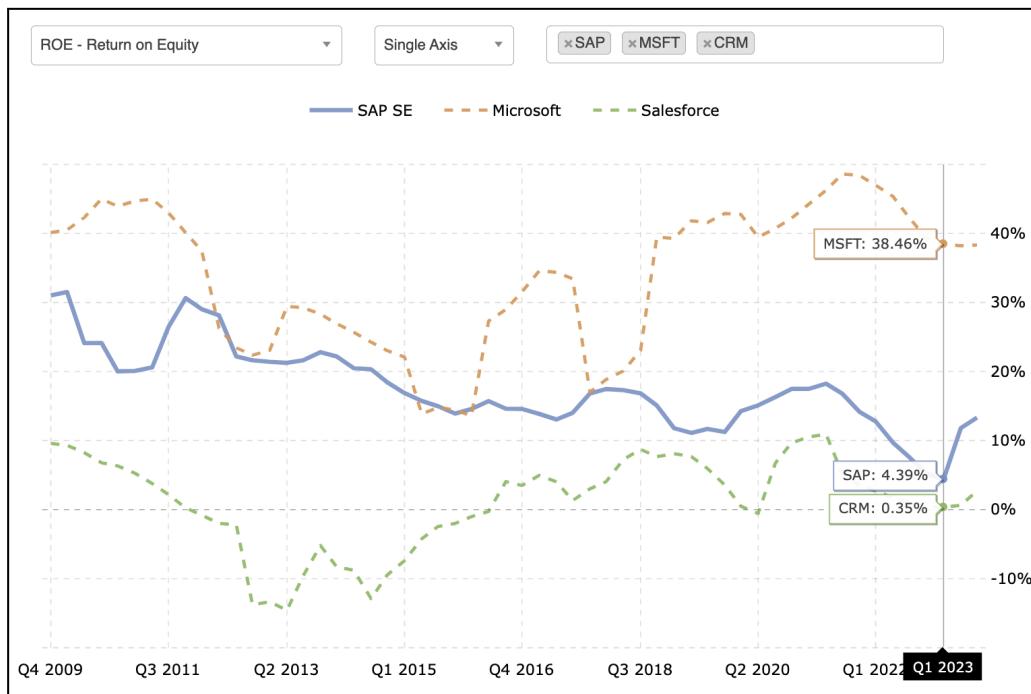
In this section, we will analyse SAP's financial situation and identify areas for improvements which we will propose in Section 3.

### 2.1. Profitability Margins

#### 2.1.1. Short-term Increase in Return on Equity (ROE)

**Analysis.** We excluded Oracle because of their low equity levels resulting in an anomalous ROE of 590.82%. ROE has been on the decline prior to Q1 2023, with a substantial drop during the COVID19 pandemic. Nevertheless, ROE has risen back to 13.74% ending 2023. In contrast to its competitors, it is still substantially lower than its main competitor, Microsoft (Figure 9).

$$\text{Return on Equity (ROE)} = \frac{\text{Net Income (Profit after Tax)}}{\text{Total Shareholder's Equity}} = \frac{5,964}{43,406} = 13.74\%$$



**Figure 9: Competitor Analysis of Return of Equity (Macrotrends, 2024)**

**Analysis.** However, this increase in ROE was driven by the divestiture of Qualtrics, where the discontinued operation was recorded as pre-tax disposal gain of €3,562 million, thereby significantly raising net income (after tax) to €2,363 million (Figure 10).

€ millions, unless otherwise stated	2023	2022
<b>Consolidated Income Statements</b>		
Cloud revenue	621	1,129
Total revenue	745	1,351
Cost of cloud	−88	−265
Total cost of revenue	−196	−499
Total operating expenses (including total cost of revenue)	−1,155	−2,771
Disposal gain before tax	3,562	0
Operating profit	3,152	−1,420
Profit (loss) before tax	3,162	−1,423
Income tax expense <sup>1</sup>	−799	64
Profit (loss) after tax	2,363	−1,359

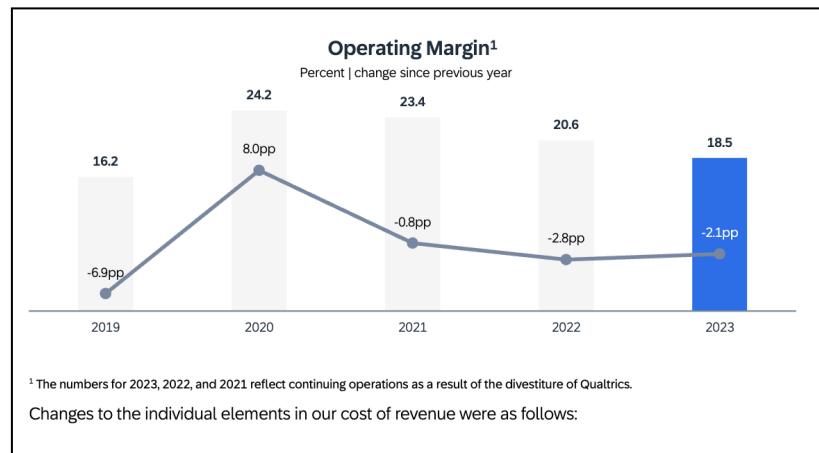
**Figure 10: SAP Consolidated Income Statement ending 2023 (SAP SE, 2023)**

**Implication.** The general declining trend of ROE tells us that SAP is not very efficient in translating equity financing into profits, which could signal capital efficiency issues. Hence, we will analyse operating margin to understand the profitability of SAP's core operations.

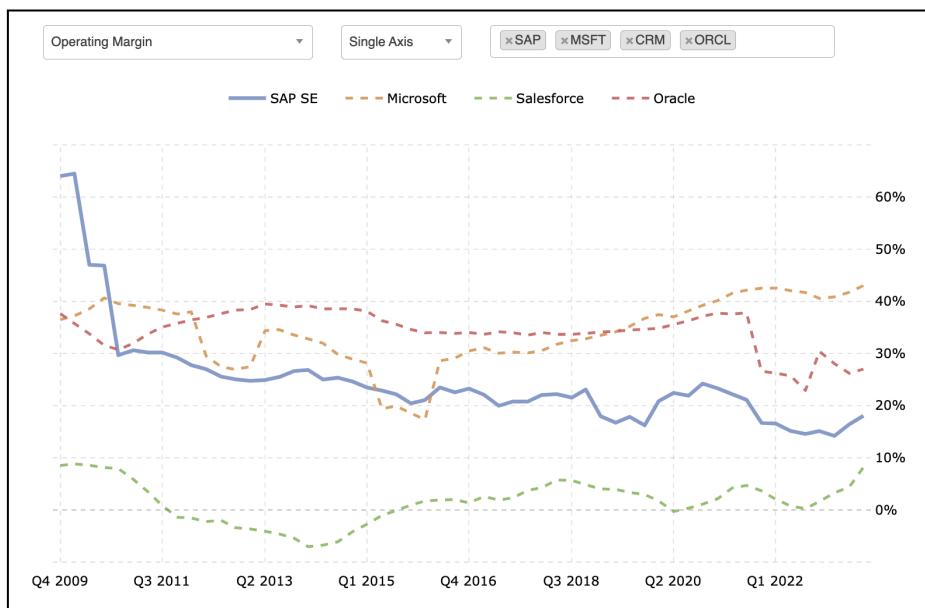
### 2.1.2. Declining Operating Profit Margins

**Analysis.** SAP's **operating margin has been on the decline** in recent years, to **18.5%** ending 2023 (Figure 11) and it is **generally lower than its competitors** (Figure 12). This is driven by a **8.50% increase in operating expenses**, to €25,420 million in 2023 and **4.98% decline in operating profit**, resulting from reduced contributions from software licences revenue.

$$\text{Operating Profit Margin} = \frac{\text{Operating Profit}}{\text{Total Revenue}} = \frac{5,787}{31,207} = \mathbf{18.5\%}$$



**Figure 11: SAP Annual Trend in Operating Margin between 2019 to 2023 (SAP SE, 2023)**



**Figure 12: Competitor Analysis of Operating Margin (Macrotrends, 2024)**

**Implication.** A declining operating margin indicates poor efficiency in generating profits from their core operations, which could indicate **weakness in their core business and market saturation in cloud ERP**. This could signal a need to **re-evaluate its business strategy** and look into new product offerings and business models to reposition itself in the market.

### 2.1.3. Operating Expense driven by Increased Personnel Costs

**Analysis.** The rise in operating expenses is mainly impacted by both **an increase in share-based payment expenses** of €2,220 million (55% increase from €1,431 million) and a **significant rise of 11.1% in average personnel expense per employee** to €160,000 in 2023 attributed to higher employee bonuses and share-based payments (Figure 13).

Full-time equivalents FTE year end	Average number of employees FTE months' end average	Average personnel expense/employee in Euro	Restructuring-related terminations in FTE
107,602 ↑ +1,291 2022: 106,312	106,043 ↑ +173 2022: 105,582	160,000 ↑ +16,000 2022: 144,000	1,857 ↑ +1,318 2022: 539

**Figure 13: SAP Employee Headcount & Personnel Expense (SAP SE, 2023)**

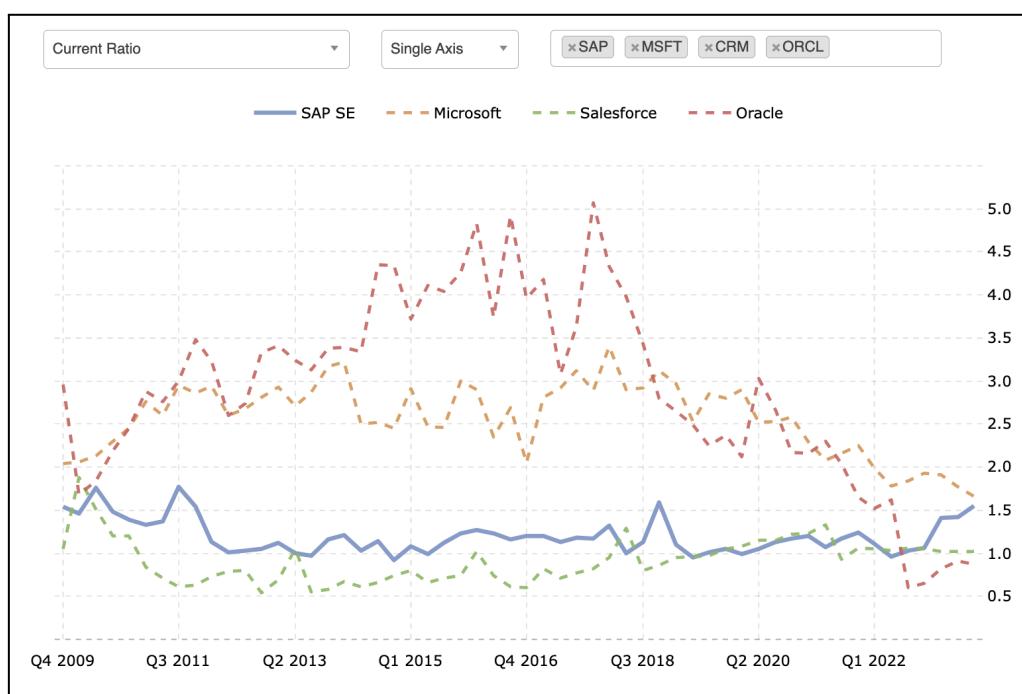
**Implication.** The competitive salaries and remuneration packages associated with software companies contribute to the high operating expenses thereby resulting in low operating profit margin for SAP. However, it is **difficult for SAP to compromise** on offering high wages as it is vital to retain their skillful workforce and prevent brain drain to its competitors, therefore they would need to leverage on their industry-expertise and business connections to stay competitive.

## 2.2. Cash Flow Analysis

### 2.2.1. Healthy Current Ratio and Strong Balance Sheet

**Analysis.** In Q4 2023, SAP presents a healthy **current ratio of 1.40** in contrast to its competitors, indicating substantial liquid assets to meet short-term liabilities (Figure 14). However, this recent increase in group liquidity<sup>1</sup> (Table 15) is mainly attributed to **Qualtrics divestiture of US\$12.5 billion**, which was initiated due to cultural mismatch and refocus towards their core product, S/4HANA (Ghoshal, 2023).

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}} = \frac{20,571}{14,642} = \mathbf{1.40}$$



**Figure 14: Competitor Analysis of Annual Current Ratio**  
**(Macrotrends, 2024)**

<sup>1</sup> Net increase in group liquidity due to Qualtrics divestiture, compensated by LeanIX acquisition, share buyback program and repayment of Eurobonds, loans and commercial paper.

<b>Group Liquidity and Net Liquidity/Net Debt</b>			
€ millions	2023	2022	Δ
Cash and cash equivalents	8,124	9,008	-883
Current time deposits and debt securities	3,151	686	2,464
<b>Group liquidity</b>	<b>11,275</b>	<b>9,694</b>	<b>1,581</b>
Current financial debt	-1,143	-3,986	2,843
Non-current financial debt	-6,612	-7,778	1,166
<b>Financial debt</b>	<b>-7,755</b>	<b>-11,764</b>	<b>4,009</b>
<b>Net liquidity (+)/net debt (-)</b>	<b>3,521</b>	<b>-2,070</b>	<b>5,590</b>
Lease liabilities	-1,621	-2,140	519
Net debt including lease liabilities	1,899	-4,210	6,109

**Table 15: SAP SE Group Liquidity, ending Dec 31, 2023 (SAP SE, 2023)**

**Implication.** While this increase of cash in hand may be short-lived, however SAP has sufficient funding from liquid assets and undrawn credit facilities of €3.0 billion<sup>2</sup> to meet their operating financing needs.

### 2.2.2. Quality Customers with Minimal Credit Loss

**Analysis.** To better understand SAP's efficiency in converting receivables into cash, which is one aspect which current ratio does not address, we dive deeper into SAP's credit risk analysis on trade receivables. The **decline in weighted average credit loss rate to -3.3%** in 2023 (Table 16), and **high receivables turnover rates of 4.95** ending Dec 2022 (Figure 17) implies **desirable receivable collection practices** are in place, ensuring minimal credit loss.

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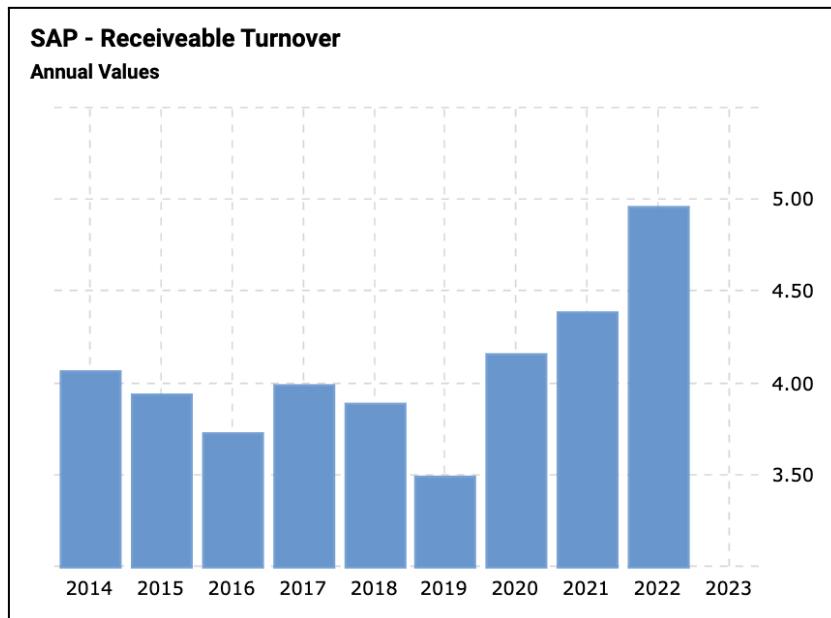
<sup>2</sup> SAP has €3.0 billion syndicated revolving credit facility, ending March 2028 plus two one-year extension options (SAP SE, 2023).

Credit Risk Exposure from Trade Receivables and Contract Assets				
€ millions, unless otherwise stated	Weighted Average Loss Rate	Gross Carrying Amount Not Credit-Impaired	Gross Carrying Amount Credit-Impaired	ECL Allowance
AR not due and due	-0.3%	4,036	2	-13
AR overdue 1 to 30 days	-0.6%	770	51	-5
AR overdue 30 to 90 days	-1.5%	564	32	-9
AR overdue more than 90 days	-27.3%	432	213	-176
<b>Total</b>	<b>-3.3%</b>	<b>5,802</b>	<b>298</b>	<b>-203</b>

Credit Risk Exposure from Trade Receivables and Contract Assets				
€ millions, unless otherwise stated	Weighted Average Loss Rate	Gross Carrying Amount Not Credit-Impaired	Gross Carrying Amount Credit-Impaired	ECL Allowance
AR not due and due	-1.0%	3,146	10	-31
AR overdue 1 to 30 days	-1.0%	1,420	80	-15
AR overdue 30 to 90 days	-2.3%	582	64	-15
AR overdue more than 90 days	-27.2%	499	236	-200
<b>Total</b>	<b>-4.3%</b>	<b>5,647</b>	<b>390</b>	<b>-261</b>

**Table 16: Credit Risk Exposure from Trade Receivables, 2023 vs 2022 (SAP SE, 2023)**



**Figure 17: SAP Annual Trend for Receivable Turnover between 2014 - 2023 (Macrotrends, 2024)**

**Implication.** High receivables turnover implies that SAP has quality customers which make timely payment, ensuring a stable cash flow for the business and more cash on hand to engage in business expansion strategies.

### 2.2.3. Debt to Equity (Gearing) Ratio

**Analysis.** For better comparison, we excluded Oracle due to their extremely high gearing ratio, ~29.68. SAP has a **relatively low gearing ratio of 0.574** (Table 18), with a **track record of low gearing ratio** in contrast to its competitors (Figure 19). This is due to their capital structure management, prioritising use of cash towards quick repayment of financial debt.

$$\text{Debt to Equity Ratio} = \frac{\text{Total Liabilities}}{\text{Total Equity}} = \frac{24,928}{43,406} = \mathbf{0.574}$$

	12/31/2023		12/31/2022		
	€ millions	% of Total Equity and Liabilities	€ millions	% of Total Equity and Liabilities	Δ in %
Equity	43,406	64	42,848	59	1
Current liabilities	14,642	21	17,453	24	-16
Non-current liabilities	10,287	15	11,858	16	-13
Liabilities	24,928	36	29,311	41	-15
Thereof financial debt	7,755	11	11,764	16	-34
Thereof lease liabilities	1,621	2	2,140	3	-25
<b>Total equity and liabilities</b>	<b>68,335</b>	<b>100</b>	<b>72,159</b>	<b>100</b>	<b>-5</b>

**Table 18: SAP SE Capital Structure Breakdown (SAP SE, 2023)**



**Figure 19: Competitor Analysis of Annual Debt/Equity Ratio**  
(Macrotrends, 2024)

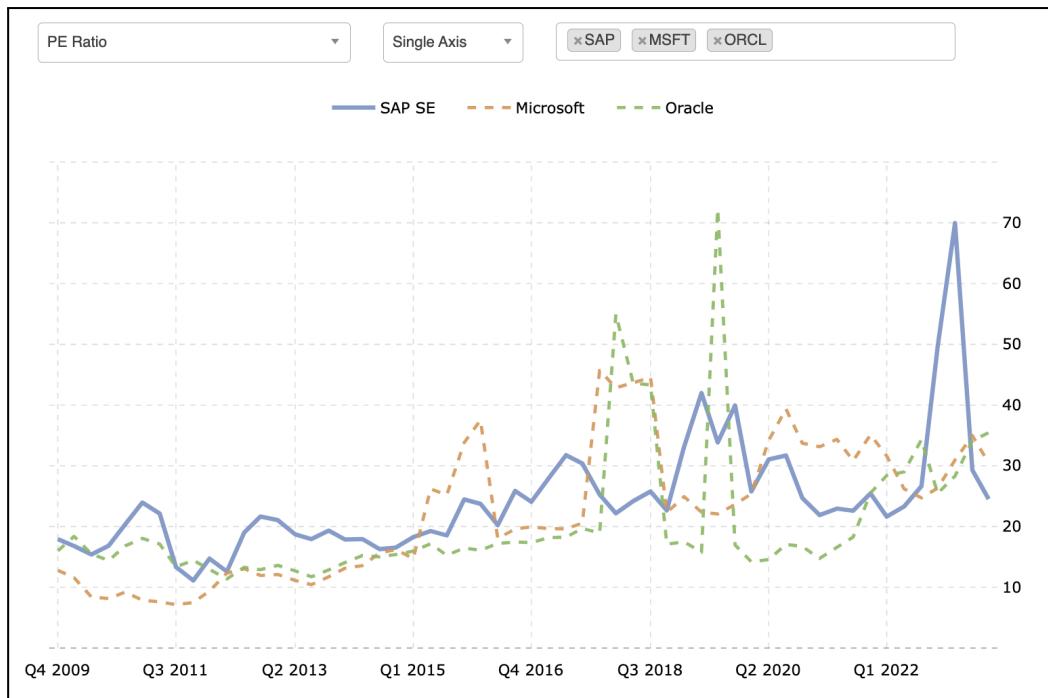
**Implication.** SAP's low gearing ratio and strong cash flow suggests an opportunity for the organisation to **leverage more on debt financing** to **accelerate their business**, especially since AI adoption is gaining traction recently. While having low financial leverage lowers the risk of the company, however we can observe this **conservative capital management structure** impacting its organisation's profitability margins, which is a cause for concern.

## 2.3. Company Activity

### 2.3.1. Rising Price-Earnings (P/E) Ratio

**Analysis.** SAP has an increasing P/E ratio in recent years and follows a similar trend to its competitors (Figure 20). The **surge in P/E ratio** in 2023 was caused by a combination of an **increase in share price by 49.81%** (Figure 21) and **decline in EPS**. This came after SAP's astounding Q3 2023 results in revenue growth arising from their **profitable and predictable cloud-services model**.

$$P/E \text{ Ratio (ending '23)} = \frac{\text{Market Value per Share}}{\text{Earnings per Share, basic}} = \frac{154.59}{5.26} = 29.39$$

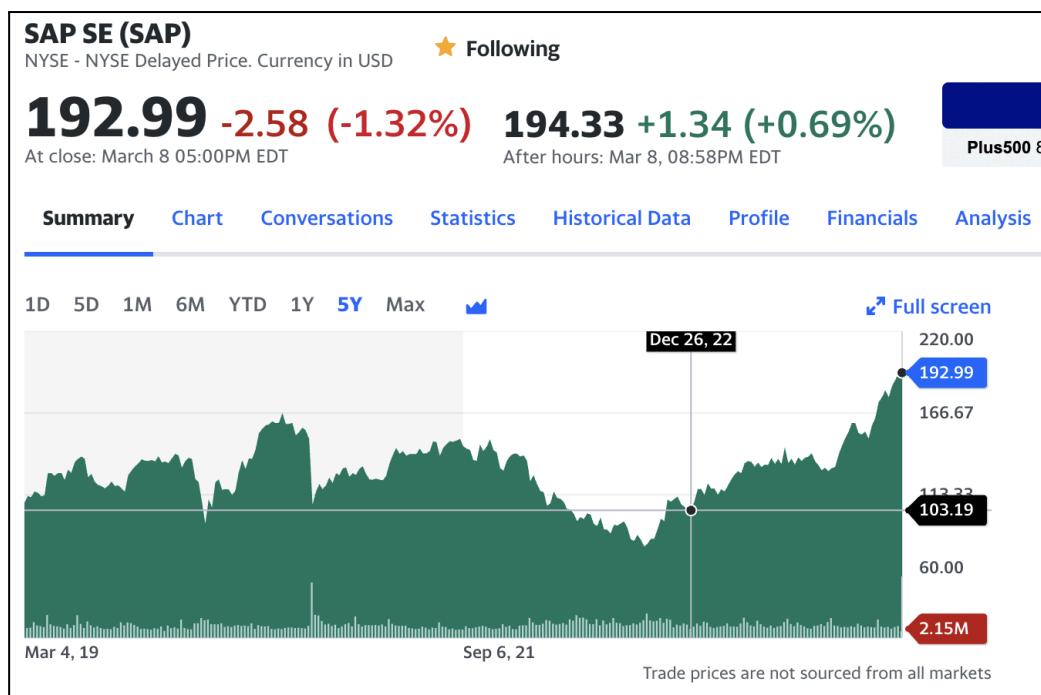


**Figure 20: Competitor Analysis of Annual P/E Ratio (Macrotrends, 2024)**

Share Price ending Dec 31, 2022 = USD 154.59

Share Price ending Dec 31, 2023 = USD 103.19

Increase in Share Price = **49.81%**



**Figure 21: Share Price of SAP (Yahoo! Finance, 2024)**

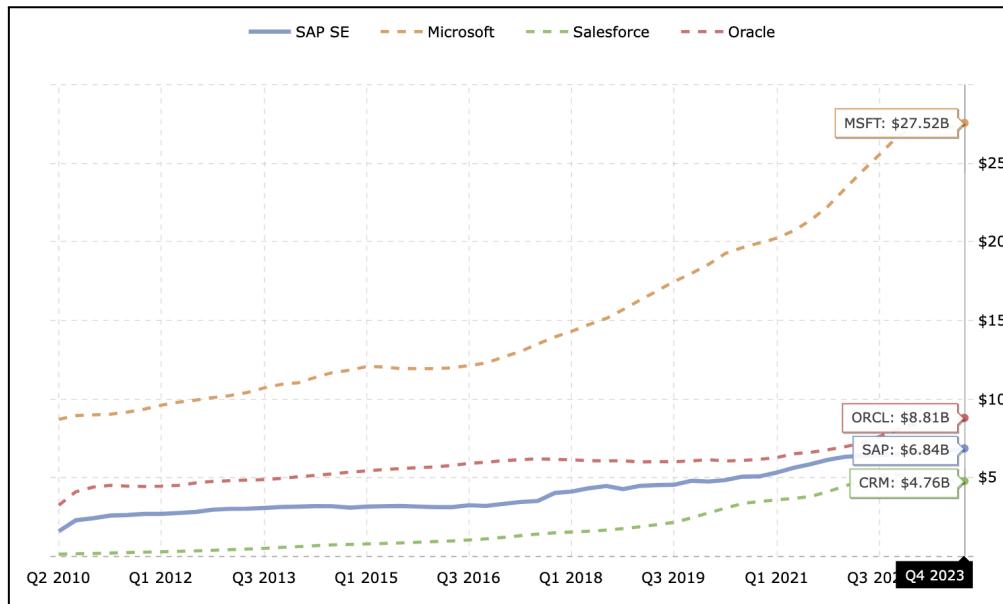


**Figure 22: Competitor Analysis of Annual EPS (Macrotrends, 2024)**

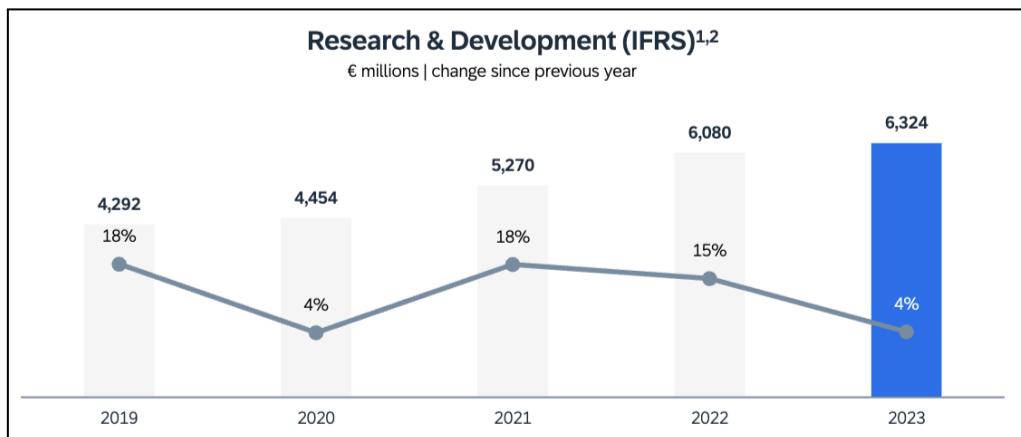
**Implication.** The rising P/E ratio suggests **improving investor confidence** towards SAP and **expectation of high growths** in the future. SAP's comparable P/E ratio with its competitors indicates that it is **fairly-valued** and considering its new restructuring towards AI integrations, it could be a **good indicator for investors**.

### 2.3.2. Significant Opportunity for Increased R&D Investments

**Analysis.** SAP investment in innovation mainly comprises product development, obtaining patents and certification for different markets, consultancy towards their product strategy and professional development of their R&D workforce. However, SAP has **significantly lower R&D expense** as compared to their peers (Figure 23), with **slowing increments in YoY R&D expense** in recent years (Figure 24).



**Figure 23: Competitor Analysis of Annual R&D expense**  
**(Macrotrends, 2024)**



**Figure 24: SAP Annual Trend for R&D expense (SAP SE, 2023)**

**Implications.** Given the highly competitive landscape of AI and its adoption, SAP may be **at risk of falling behind competitors** if they do not invest more capital into R&D efforts, especially when **Microsoft is investing almost 4 times more capital into R&D expenses**. SAP is also able to leverage on their strong financial position to take on more debt financing to accelerate growth in AI adoption, and establish a new position in the market.

### 2.3.3. New Leadership focused on Artificial Intelligence

**Analysis.** In February 2024, SAP introduced a **new end-to-end chief AI officer** role under the leadership of **Dr Philipp Herzig** aimed at accelerating the pace of AI integrations into various SAP solutions (Bloomberg, 2024). Additionally, SAP recently nominated **Pekka Ala-Pietilä**, formerly the Chair of Finland's Artificial Intelligence Programme (2017 - 2019) and Chairman of EU Commission's High-Level Expert Group on Artificial Intelligence (2018 - 2020) to **assume the role of chairman of the SAP Supervisory Board** (SAP News Centre, 2024).

**Implications.** The introduction of the new role of chief AI officer and an incoming chairman with a **wealth of experience in AI**, affirms SAP's vision towards their **new strategic focus**, integrating AI into core solutions. With Ala-Pietilä's expertise in AI, it could complement CEO Christian Klein's

successful leadership in their current cloud transformation journey. Under their combined strengths, SAP is well poised to pivot their towards AI-centric solutions.

## 2.4. Summary of Financial Analysis Findings

**Strong & Stable Financial Position.** SAP SE has **substantial levels of cash flow, strong balance sheet, and good credit management**, signifying financial stability which increases the flexibility to engage in value-adding initiatives.

**Weakening Profitability.** However, SAP is facing weakness in core business with declining profitability margins due to **rising operational costs and competitive IT landscape**. SAP's conservative capital management structure is also limiting the organisation's ability to accelerate their business.

**Need for New Competitive Advantage.** Therefore, it is impeccable for SAP to leverage on their **strong financial position** to discover a **new competitive advantage**, which encompasses their **business intelligence expertise** in the age of AI.

### 3. Value Proposition Proposal

#### 3.1. SAP Key Challenge in Cloud Migration

Despite significant developments towards integrating AI into SAP's core product, S/4HANA cloud, SAP is **struggling with converting ½ of existing SAP customers from legacy on-premises systems to S/4HANA cloud** (Clark, 2022), which could be the key reason for declining operating margins in recent years and **limiting the success of SAP's Business AI** in driving growth for the company.

In efforts to incentivise customers to migrate to S/4HANA cloud immediately, SAP has launched the following initiatives:

##### 3.1.1. Termination of On-premise Support and Raising Support Costs

To drive cloud adoption, SAP has employed aggressive tactics, announcing the **termination of maintenance support for SAP ECC<sup>3</sup> by 2027** (O'Donnell, 2020) and increasing on-premise support costs in July 2023 (Sayer, 2023). These efforts are targeted at increasing the opportunity cost of delaying cloud migrations, spurring customers to make timely transitions.

##### 3.1.2. New Credit Offerings in RISE with SAP

To aid existing customers cope with running costs of S/4HANA cloud migration, subscription-based RISE with SAP cloud initiative is **offering up to 60% of credit for their first year's fees for on-premise users** who sign up for Rise with SAP in 2024 (Sayer, 2024). This credit offering aims to **offset around half of the overall cost** of cloud migration, which seeks to incentivise existing customers to switch to S/4HANA.

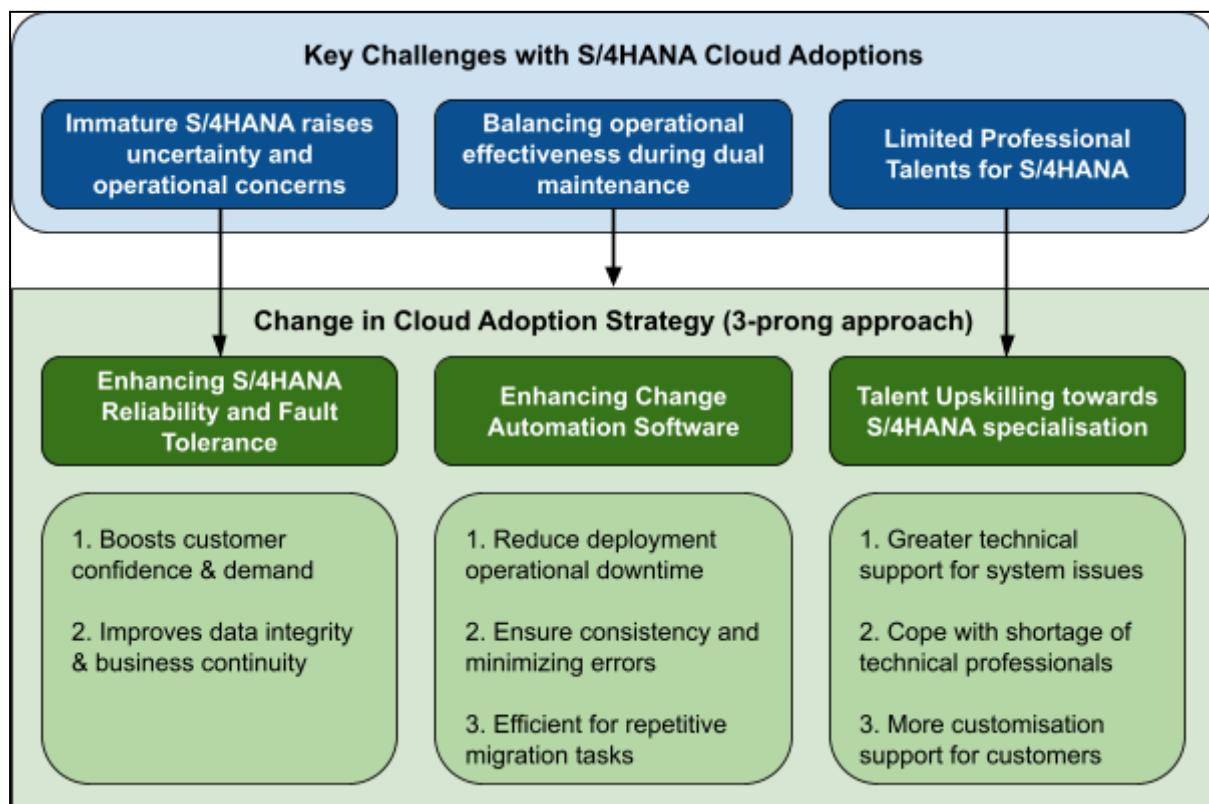
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<sup>3</sup> SAP Enterprise Central Component (ECC) is their traditional on-premise ERP software solution prior to the S/4HANA cloud ERP software.

### 3.1.3. Exclusivity of Recent AI Innovations

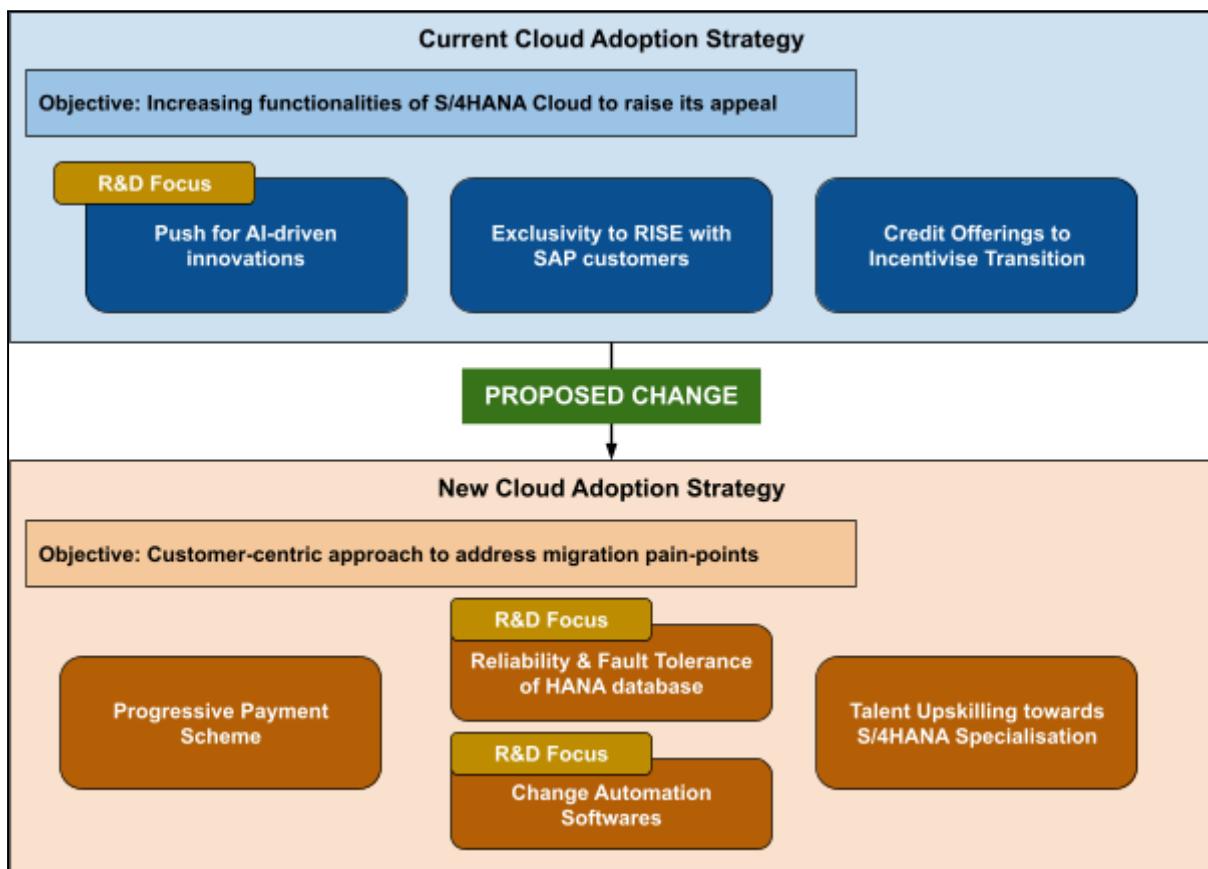
CEO Christian Klein mentioned that **AI and sustainability-driven innovations** would only be available for S/4HANA Cloud services, and would **cost a 30% premium** (O'Donnell, 2023). This was justified through their use of unique industry-specific data during machine learning, which increases the appeal of adopting S/4HANA to leverage its new software capabilities.

The **limited effectiveness of pressure tactics** employed by SAP suggests the need to employ a different strategy to promote S/4HANA adoption for existing customers. Figure 25 outlines the key challenges and the **proposed change in cloud adoption strategy** which is targeted at **reducing the implementation costs and complications** associated with S/4HANA migration.



**Figure 25: Key Challenges of S/4HANA Migration and Proposed Changes for SAP**

The proposed change in cloud adoption strategy encompasses a shift in R&D focus and greater emphasis on addressing customer-related problems with S/4HANA current implementation (Figure 26).



**Figure 26: Proposed Change in Cloud Adoption Strategy**

### **3.2. Reviewing S/4HANA Pricing Strategy**

Despite the credit offering presented for RISE with SAP, Glig<sup>4</sup> mentioned that implementation costs are still the main hurdle for organisations (Sayer, 2024). In order to convert more existing customers before 2027, a different pricing strategy might make it more financially feasible for customers to make this transition.

#### **3.2.1. Exorbitant Price Tag with HANA Database Migration**

In order to leverage on S/4HANA full potential, organisations are required to do away with traditional database technologies and migrate to the new HANA database. This requires both change management within the organisation and revamping existing business processes and technologies in order to adopt S/4HANA. Along with deeply coupled legacy systems with SAP ECC software, it significantly raises the implementation cost of database migrations, hindering customers from making the transition.

#### **3.2.2. Progressive Pricing Scheme for Early Stages of Migration Journey**

Given the high upfront investments required for S/4HANA cloud migrations, SAP can alleviate their customer's financial concerns by offering a progressive pricing scheme for new cloud users during the early stages of their migration journey. Given that SAP has good credit management and strong cash flow, it enables them to offer this payment scheme.

We demonstrate this progressive scheme using a 12-month cloud migration time-frame, with an average of \$50,000 of monthly cloud subscription for data migration services (Figure 27).

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<sup>4</sup> Jan Gilg is SAP chief product officer for cloud ERP.

Month	1	2	3	4	5	6	7	8	9	10	11	12
<b>Current (\$)</b>	50	50	50	50	50	50	50	50	50	50	50	50
<b>Total Yearly Payment (Current)</b>												\$600,000
<b>Progressive (\$)</b>	20	20	20	40	40	40	60	60	60	80	80	80
<b>Total Yearly Payment (Progressive)</b>												\$600,000

**Table 27: Proposed Progressive Pricing Scheme (Figures in '000s)**

### 3.3. R&D Focus towards Change Automation Softwares

An indirect way to lessen the financial costs for customers is through enhancements of SAP's change automation softwares used during cloud migration. A robust software can aid to boost customer confidence and reduce the perceived migration costs for customers.

#### 3.3.1. Long hybrid process of cloud migration

Cloud migrations from SAP ECC to S/4HANA is projected to take 12 - 18 months or longer (Ecosio, 2023), and it is critical for organisations to remain operationally efficient during this period of dual maintenance between legacy ECC and S/4HANA cloud. Automation can aid to eliminate dependency issues and avoid business disruption during this hybrid migration process (Lees, 2024).

#### 3.3.2. Consistent BAU upgrades

This allows for planned, managed, tested and deployment upgrades with business as usual operations. Robust change automation software can enforce code-quality and reduce risk of manual errors & checks, accelerating deployment cycles of existing applications.

### 3.4. R&D Focus towards System Reliability of HANA Database

Ensuring a reliable and fault-tolerant HANA database provides customers with **greater reassurance** over data integrity and functionality concerns. It also provides stronger justification for switching from traditional databases to HANA Database.

#### 3.4.1. Immature Stage of S/4HANA Implementation

Due to the infancy stage of S/4HANA, it presents reliability concerns during operations such as SAP HANA **server shuts down** during heavy data processing and its **inability to support certain ERP products** due to its business architecture (Dataflair, 2019). This presents a need to improve on the existing system reliability of the HANA database which is essential to its future growth as a cloud-based ERP tool.

#### 3.4.2. Cost-Benefit Analysis of Projected R&D Expenditure

The subsequent cost-benefit analysis will use the average personnel cost of SAP (Figure 28) and cost breakdown of S/4HANA implementation (Figure 29).

Full-time equivalents FTE year end	Average number of employees FTE months' end average	Average personnel expense/employee in Euro	Restructuring-related terminations in FTE
107,602 <small>↑ +1,291 2022: 106,312</small>	106,043 <small>↑ +173 2022: 105,582</small>	160,000 <small>↑ +16,000 2022: 144,000</small>	1,857 <small>↑ +1318 2022: 539</small>

**Figure 28: SAP Employee Statistics 2023, (SAP SE, 2023)**

Cost Component	On-Premise (One-Time Fee)	Cloud (Monthly Subscription)	Notes
Basic License	\$100,000 - \$1,000,000	\$20,000 - \$100,000	Based on the number of users, modules, and other functionalities
Named User Licenses	\$1,500 - \$4,000 per user	\$100 - \$250 per user	Varies by user roles
Engine & Component Licenses	\$10,000 - \$200,000	Included or extra	E.g., advanced analytics, IoT capabilities
Implementation Costs	\$50,000 - \$500,000	\$10,000 - \$100,000	Costs for consultants, training, etc.
Data Migration	\$10,000 - \$100,000	\$5,000 - \$50,000	If migrating from another system
Custom Development	\$20,000 - \$200,000	\$10,000 - \$100,000	For functionalities not available out-of-the-box
Maintenance & Support	18-22% of license fee annually	Included or extra	Ongoing technical support
Hardware	\$50,000 - \$500,000	N/A	Only for on-premise; cloud is generally hosted
Updates and Upgrades	\$5,000 - \$50,000	Included	For on-premise, based on new versions or functionalities

**Figure 29: Cost Breakdown of S/4HANA On-Premise & Cloud (SAP SE, 2024)**

From Table 30, we can observe that the projected benefit arising from engaging in this R&D focus significantly outweighs the cost, via highly profitable new RISE with SAP contracts, these contracts create long-term revenue gains when customers are locked in to the SAP ecosystem.

Projected 1-Year Cost-benefit Analysis	
Costs	
Additional headcount for Change Automation Software <sup>5</sup> (\$)	€160,000 * 15 hc = €2,400,000 (~£2,064,536)
Projected cost of R&D project for Change Automation (\$)	<b>£3,000,000</b>
Additional headcount for System Reliability Enhancements (\$)	€160,000 * 15 hc = €2,400,000 (~£2,064,536)
Projected cost of R&D project for System Reliability Enhancements (\$)	<b>£2,000,000</b>
Total R&D Expenditure (\$)	<b>£9,129,072</b>

<sup>5</sup> For R&D expenses, we calculated additional headcount to each sector, with average personnel cost of \$160,000 as indicated in Figure 12.

Benefit	
Average value RISE with SAP cloud contract <sup>6</sup>	5,400,000 / 3 = \$1,800,000 (~£1,448,420)
# of new RISE with SAP cloud contract <sup>7</sup>	23,000 * 0.1% = 23
Total value of new RISE with SAP contracts	£33,313,660
Cost-savings of reliable HANA databases <sup>8</sup>	300,000 * 2 hr = \$600,000 (~£482,810)
Net Cost-Benefit Valuation	£33,796,470

**Table 30: Cost-Benefit Analysis of increasing R&D expense on System Reliability**

### 3.5. Coping with Talent Shortage for S/4HANA

The early-stages of S/4HANA and shortage of technical experts increases the **operational risks** to customers onboarding S/4HANA as their core ERP tool. This serves as a significant deterrence for customers considering to migrate to the new cloud software. Investing in a **talent upskilling programme** could be the remedy to accelerating S/4HANA maturity and raising its talent pool.

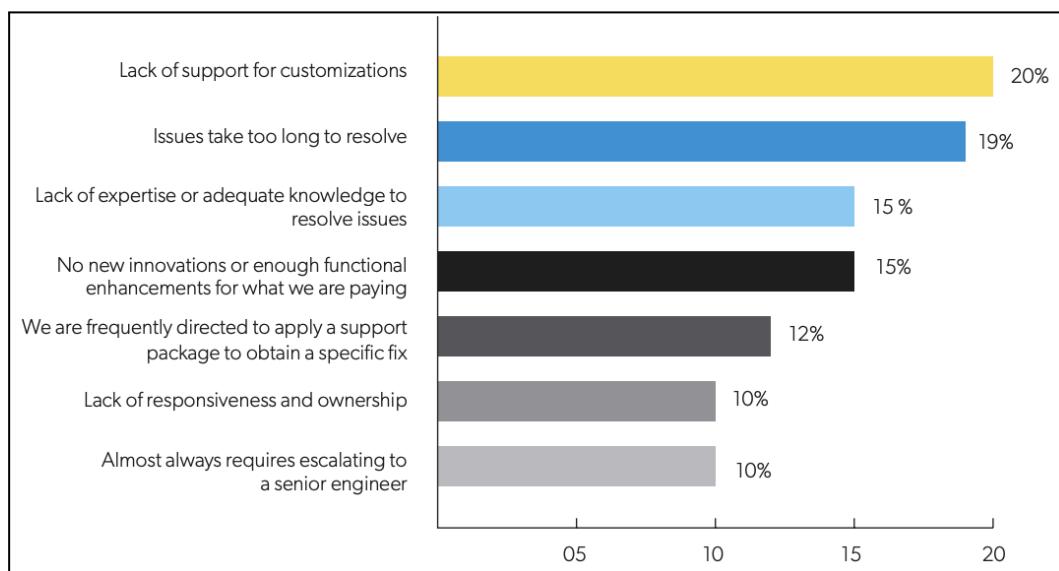
#### 3.5.1. Shortage of Available Professional Talents

Rimini Street survey on S/4HANA customers revealed that 34% cited **technical incompetence** and **inefficiency in resolving S/4HANA-related issues** and 20% cited lack of support for customisable features, where  $\frac{2}{3}$  of support issues were related to custom code (Figure 31). This was attributed to inefficiencies in SAP support model and the shortage of professional S/4HANA engineers (Rimini Street, 2021).

<sup>6</sup> Average annual cost of RISE with the SAP contract is \$5.4 million over 3 years (SAP SE, 2023).

<sup>7</sup> Based on Gartner's estimate of 23,000 customers who have yet to purchase RISE with SAP, our conservative estimate is that these R&D efforts would convert 0.1% (Feldberg, 2023).

<sup>8</sup> Cost of database downtime taken as \$300,000/hour, with an average of 2 hour to resolve (Holt, 2023).



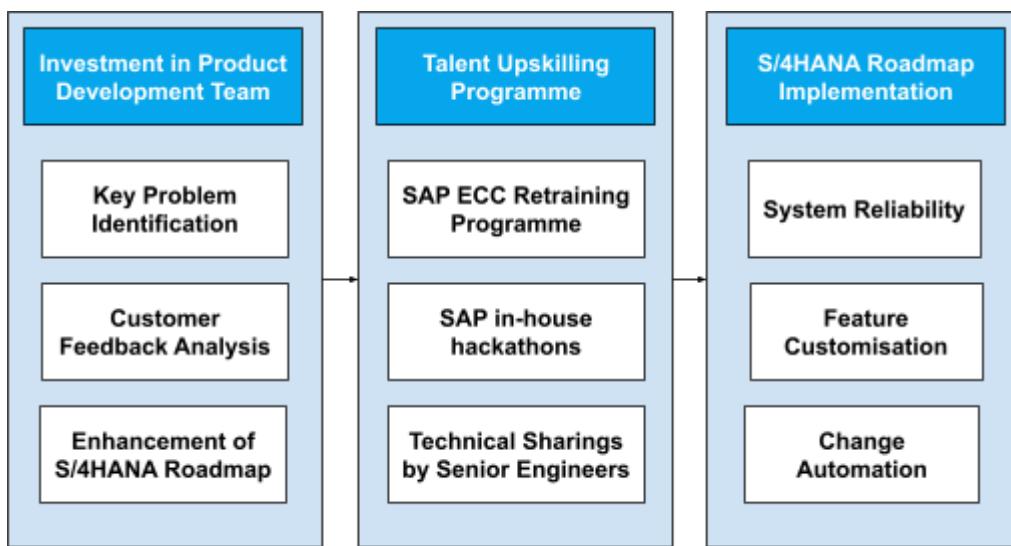
**Figure 31: S/4HANA Key Challenges faced by SAP Support (Rimini Street, 2021)**

### 3.5.2. Talent Pool is Critical to S/4HANA's Maturity

The limited number of S/4HANA case studies due to its infancy phase raises the operational risks associated with S/4HANA go-live production environment, and can result in system breakdowns, as experienced by Haribo (Sanders, 2019) and Revlon (Kimberling, 2019). Nurturing S/4HANA specialists would be quintessential to dealing with future downtime and building more resilient softwares.

### 3.5.3. S/4HANA Talent Upskilling Programme

Engaging in S/4HANA talent upskilling programme can **raise the number of technical experts** that would be available to resolve the main challenges faced by SAP support, **reduce the need for senior engineer escalation** and accelerate software development of S/4HANA. We detail the programme timeline in Figure 32.



**Figure 32: SAP Proposed Talent Upskilling Timeline**

The talent upskilling programme would be focused on the following enhancement aspects of S/4HANA, which has been highlighted as the key concerns faced by onboarded users.

1. **More Customisation for ERP tools.** Unlike traditional SAP ECC systems, the lack of customizability is a significant concern for customers who require the added flexibility when integrating S/4HANA into their business processes.
2. **Fostering the S/4HANA developer community.** Developers would be better able to collaborate and learn from each other, which accelerates software development and employee learning capacities.
3. **SAP ECC Retraining Programme.** This programme is focused on upskilling legacy ECC specialists to implement SAP new S/4HANA system

Focusing on these **critical areas of concern** would be more beneficial for SAP in the long-run, instead of their recent push for AI innovations as it ensures that **customers would not get left behind** during this cloud migration transition.

## 4. Risk Analysis

### 4.1. SAP Risk Management

In this section, we will be analysing the potential risks faced by SAP based on operational, financial, strategic and hazards (Table 33). Subsequently, we will narrow our focus towards **operational risk** which has the most significant impact to SAP's core business and strategic risks.

Risk Identification	Risk Description	Risk Consequence
<b>Operational</b>	<ul style="list-style-type: none"> <li>System downtime for cloud technology infrastructures</li> </ul>	<ul style="list-style-type: none"> <li>Customer dissatisfaction and loss of trust in SAP brand</li> </ul>
	<ul style="list-style-type: none"> <li>Revenue loss to 3rd-party vendors for cloud migration</li> </ul>	<ul style="list-style-type: none"> <li>Loss in potential customer and failure to convert existing clients</li> </ul>
	<ul style="list-style-type: none"> <li>Need for change management due to S/4HANA implementation</li> </ul>	<ul style="list-style-type: none"> <li>Delayed deliveries of cloud capabilities</li> <li>Resistance towards adoption for customers</li> </ul>
	<ul style="list-style-type: none"> <li>Integration &amp; compatibility issues for S/4HANA</li> </ul>	<ul style="list-style-type: none"> <li>Additional cost for adapting systems to complement S/4HANA</li> </ul>
	<ul style="list-style-type: none"> <li>Cybersecurity attacks and breaches</li> </ul>	<ul style="list-style-type: none"> <li>Financial loss owed to compensation or litigation</li> </ul>
	<ul style="list-style-type: none"> <li>Shortage of professional technical talents</li> </ul>	<ul style="list-style-type: none"> <li>Slowing innovation and efficiency of workforce</li> </ul>
<b>Financial</b>	<ul style="list-style-type: none"> <li>Credit risk of cloud subscription licences</li> </ul>	<ul style="list-style-type: none"> <li>Cash flow disruptions may limit expansion strategies</li> </ul>
	<ul style="list-style-type: none"> <li>Loss of protection for firm's IP rights</li> </ul>	<ul style="list-style-type: none"> <li>Inability to maintain licences for third-party technology</li> </ul>
<b>Strategic</b>	<ul style="list-style-type: none"> <li>Loss of market position due to strong competition</li> </ul>	<ul style="list-style-type: none"> <li>Loss of market share and competitive advantage</li> </ul>
	<ul style="list-style-type: none"> <li>Failure to adhere to regulatory compliance</li> </ul>	<ul style="list-style-type: none"> <li>Incur substantial fines, legal disputes and damage to reputation</li> </ul>
	<ul style="list-style-type: none"> <li>Failure to convert customers to adopt S/4HANA</li> </ul>	<ul style="list-style-type: none"> <li>Revenue loss to competitors, and missed opportunities may hamper growth potential of S/4HANA</li> </ul>

<b>Hazards</b>	<ul style="list-style-type: none"> <li>• Natural disasters for data centres and infrastructure</li> <li>• Economic downturns</li> </ul>	<ul style="list-style-type: none"> <li>• Operational disruptions and Recovery costs</li> <li>• Slow sales in service contracts</li> </ul>
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**Table 33: Potential Risk and Consequences of SAP**

## 4.2. Risk Probability

In this section, we will analyse the probability of the operational risks with justifications (Table 34). We will use a **1-year time-frame** for this probability matrix, since customer acquisition evaluations for RISE with SAP are conducted annually.

<b>Operational Risk Description</b>		<b>Risk Probability</b>	<b>Score (1 - 5)</b>
• System downtime for cloud technology infrastructures		< 2%	1
• Revenue loss to 3rd-party vendors for cloud migration		10 - 30%	3
• <b>Need for change management due to S/4HANA implementation</b>		<b>&gt; 50%</b>	<b>5</b>
• <b>Integration &amp; compatibility issues for S/4HANA</b>		<b>&gt; 50%</b>	<b>5</b>
• Cybersecurity attacks and breaches		< 2%	1
• <b>Shortage of professional technical talents</b>		<b>&gt; 50%</b>	<b>5</b>
<b>Probability Scores</b>	V. High (5) > 50%	High (4) 30 - 50%	Medium (3) 10 - 30%
		Low (2) 2 - 10%	V. Low (1) < 2%

**Table 34: Risk Probabilities of SAP Operational Risks**

### 4.2.1. System Downtime for Cloud Technology Infrastructure

**Low Probability (Score: 2).** Despite user complaints regarding system downtimes for S/4HANA, these occurrences are related to computationally intensive calculations, which may be due to the immaturity of S/4HANA. Within the 1-year time frame, developments towards S/4HANA software could

rectify these issues, therefore we assign a low likelihood of occurrence for system downtime.

#### **4.2.2. Revenue loss to 3rd-party vendors for Cloud Migration**

**Medium Probability (Score: 3).** In PwC's study on S/4HANA transformation, 44% of companies engaged in the brownfield approach while only 14% engaged in the greenfield approach (LeanIX, 2024). The Brownfield strategy involves adapting existing systems and business processes to S/4HANA implementation, and normally involves the use of 3rd-party enterprise architecture (EA) tools during its transition (Upadhyay, 2023) while the Greenfield approach involves a complete reengineering of the organisation's ERP system. However, the recent acquisition of LeanIX aims to mitigate some of this operational risk.

#### **4.2.3. Need for Change Management due to S/4HANA Implementation**

**Very High Probability (Score: 5).** S/4HANA implementation mandates the switch towards HANA database, which requires significant management overhead including changes to existing business processes, database migrations, and workforce retraining in order to gain competency over S/4HANA and complete successful integration. Majority of SAP's customers would need to engage in change management, either to rethink their operational needs or to adopt S/4HANA, which could slow down operational deployment. (du Preez, 2022).

As highlighted by EY's paper on change management for modern ERP tools, for firms to fully leverage on S/4HANA solutions, rethinking existing business processes and use cases of ERP implementations is essential to extract performance and value (Ernst & Young, 2024). However, flexible mindsets for change are necessary to achieve this result, which is heavily dependent on organisation's management, therefore granting a high risk probability.

#### 4.2.4. Integration & Compatibility issues for S/4HANA

**Very High Probability (Score: 5).** Despite S/4HANA design focus towards simplicity through SAP Fiori, the limited customisable features makes it challenging for existing customers, who have heavily customised SAP ECC, to adopt S/4HANA into their existing workflows (Rashid, 2023).

According to Deloitte study on S/4HANA implementation challenges, effectively incorporating S/4HANA requires reconsiderations towards system architectures, performing data cleansing for new HANA database and verifying S/4HANA's strategic fit to the organisation through proof of concept and development of an agile roadmap. Therefore, these factors contribute to greater probability of occurrence.

#### 4.2.5. Cybersecurity attacks and Breaches

**Very Low Probability (Score: 1).** SAP has dedicated security best practices for each of their enterprise solutions, leveraging on their industry-expertise within the cybersecurity domain to ensure their solutions are adequately safeguarded and adheres strictly to ISO standards (Boch, 2023). Furthermore, the most recent cyberattack on SAP systems occurred in 2015 (Nagy, 2023), which indicated cyber-security protocols have been improving in recent years, making it less probable for this operational risk to occur.

#### 4.2.6. Shortage of Professional Technical Talents for S/4HANA

**Very High Probability (Score: 5).** With rising global demand for skilled developers, SAP increased learning opportunities by introducing AI learning contents and certifications through SAP learning site, with the aim of upskilling two million professionals by 2025 (Mueller, 2023). However, these initiatives are aimed towards the generic public even though the root problem lies in shortage of professional talents specialised in S/4HANA implementation. Therefore, as S/4HANA matures and increases in complexity,

the rising demand for senior specialised developers makes this operational risk more probable for SAP.

### 4.3. Potential Impact

After evaluating the risk probability in the previous section, we will monetize the potential annual cost of the operational risk to SAP (Table 35).

Operational Risk Description		Annual Cost (£)	Score (1 - 5)
• System downtime for cloud technology infrastructures		£1,744,074	2
• Revenue loss to 3rd-party vendors for cloud migration		£1,779,160	2
• Need for change management due to S/4HANA implementation		£217,660,000	4
• Integration & compatibility issues for S/4HANA		£435,540,000	5
• Cybersecurity attacks and breaches		£4,036,500	2
• Shortage of professional technical talents		£16,219,200	3
<b>Impact Scores</b>	V. High (5) 80 - 100%	High (4) 60 - 80%	Medium (3) 40 - 60%
		Low (2) 10 - 40%	V. Low (1) < 10%

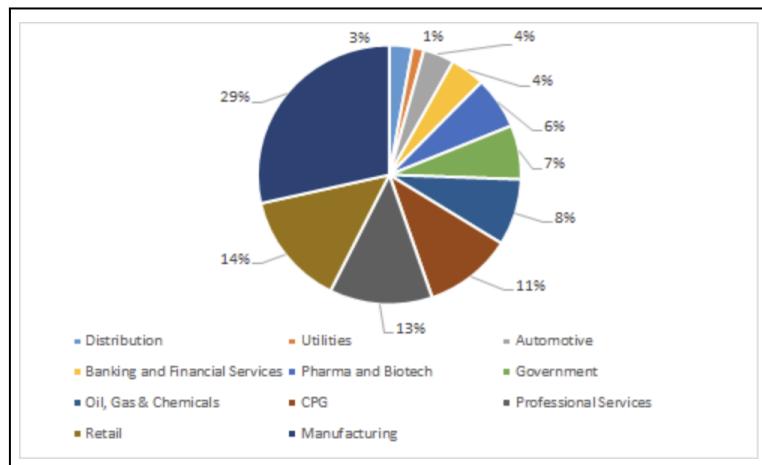
**Table 35: Risk Probabilities of SAP Operational Risks**

#### 4.3.1. System Downtime for Cloud Technology Infrastructure

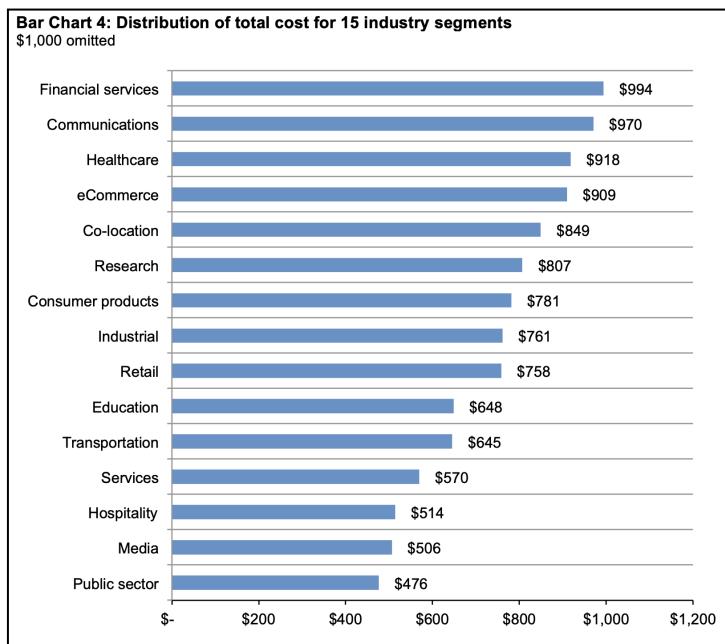
**Low Impact (Score: 2).** The majority of SAP customers fall under the Oil, Gas & Chemical and Retail industry (Figure 36). According to Ponemon Institute, SAP system downtime could cost around \$758,000 and \$761,000 per hour on average for the respective industries annually, this could go up to \$900,000 per hour for financial services industries (Table 37). The average duration to resolve downtimes is 95 minutes.

In addition, given the large scale of SAP solution, system downtime is also detrimental to reputation and compensation, therefore, we will include an

additional increase of 80% during our cost estimation. For our risk assessment, we will take cost of system downtime to be \$1,200,166<sup>9</sup> (~£968,930) along with the additional intangible costs, resulting in **annual cost of £1,744,074** (80% increase in cost), hence attributing to a low risk impact for SAP.



**Figure 36: Industry Breakdown of SAP customers using ECC or S/4HANA (Software Global Leads, 2023)**



**Figure 37: Bar Chart of Total Cost of Unplanned IT Downtime (Ponemon Institute, 2016)**

<sup>9</sup> Expected annual downtime calculated as \$758,000 \* 95 / 60 minutes = \$1,200,166 (USD), £968,930.

#### 4.3.2. Revenue loss to 3rd-party vendors for Cloud Migration

**Low Impact (Score: 2).** In PwC's study on S/4HANA transformation, 44% of companies engaged in the brownfield approach while only 14% engaged in the greenfield approach (LeanIX, 2024). The Brownfield strategy involves adapting existing systems and business processes to S/4HANA implementation, and normally involves the use of 3rd-party enterprise architecture (EA) tools during its transition (Upadhyay, 2023) while the Greenfield approach involves a complete reengineering of the organisation's ERP system. With a significant proportion of customers adopting the brownfield approach, SAP might suffer from potential revenue loss as customers engage third-party vendors instead of engaging SAP consultants.

The recent acquisition of LeanIX together with Signavio<sup>10</sup> however seeks to combat this potential revenue loss, by speeding up organisations digital transformation journey which is essential for the cloud migration process. This may encourage firms running on SAP ECC instances to transition towards S/4HANA, facilitating the process and reducing the reliance on external vendors (Chillingworth, 2023). Furthermore, the objectives of these third-party solutions are geared towards facilitating S/4HANA eventual adoption. Therefore, we estimate the revenue loss by using a 0.5% contribution of third-party vendors towards the decline in software support revenue, annual cost of £1,779,160 (Equation 1), thereby granting a low risk impact to SAP.

$$\text{Revenue Loss} = \text{Decline in Software Support} * \text{Contribution by 3rd party vendors}$$
$$(\text{€}11,908 - \text{€}11,495) * 10^6 * 0.5\% = \text{€}2,065,000 (\sim \text{£}1,779,160)$$

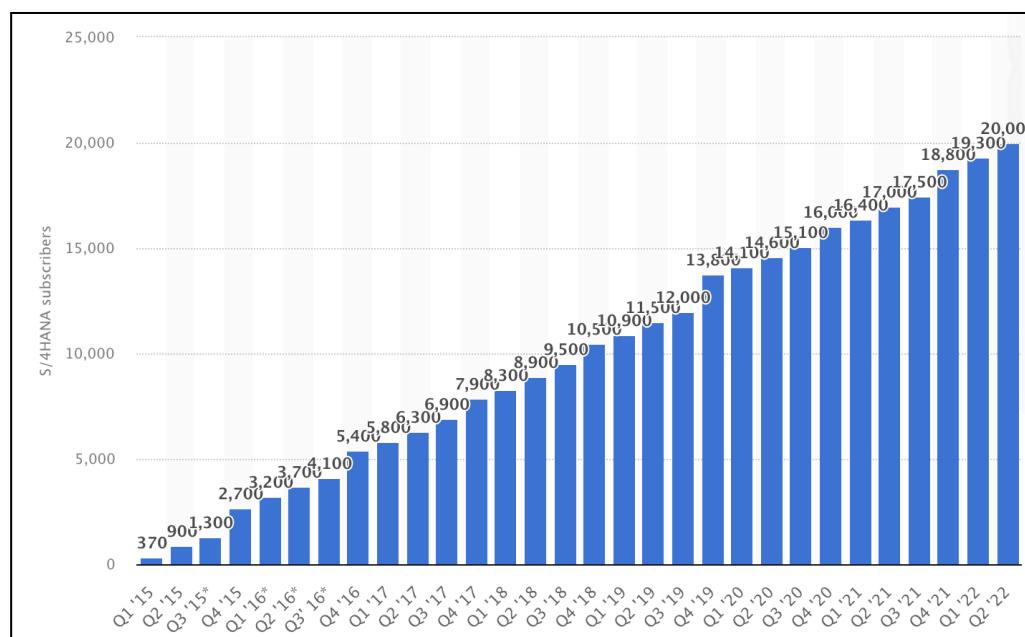
**Equation 1 - Estimation of Revenue Loss due to 3rd-party vendors**

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<sup>10</sup> SAP Signavio is a business process transformation suite dedicated towards designing, analysing and improving business processes and managing process changes and monitoring of long-term adjustments.

#### 4.3.3. Need for Change Management due to S/4HANA Implementation

**High Impact (Score: 4).** Due to the difficulty of assessing the impact of customer's change management strategy on SAP's revenue, we will estimate the impact cost based on the potential revenue loss arising from an unsuccessful conversion of existing customers to a new RISE with SAP contract. The number of S/4HANA subscribers grew by roughly 17.5% year-on-year with an increase of 3,000 customers from Q2 2021 to Q2 2022 (Figure 38).



**Figure 38: Number of SAP S/4HANA subscribers globally, 2015 - 2022, by quarter (Vailshery, 2023)**

Using this figure, we estimate that a significant proportion of customers will be impacted by the need for change management, 5%. Therefore, our estimated annual revenue loss due to this operational risk is **£217,660,000** (Table 39), thereby granting a high risk impact.

Item	Annual Cost
RISE with SAP contract	<b>\$1,800,000</b>
Loss in customers due to change management	(Q2'22 - Q2'21) * 5% (20,000 - 17,000) * 0.05 = <b>150</b>
Estimated Revenue Loss (\$)	150 * 1,800,000 = <b>\$270,000,000</b>
Estimated Revenue Loss (£)	<b>£217,660,000</b>

**Table 39: Estimated Revenue Loss due to Change Management**

#### 4.3.4. Integration & Compatibility issues for S/4HANA

**Very High Impact (Score: 5).** We will use the same analysis framework as the previous operational risk to estimate the potential revenue loss (Section 4.3.3). The lack of comprehensive data management strategies further raises the compatibility risk of integrating S/4HANA, slowing down the adoption of AI, and preventing real-time decision making, ultimately diminishing the benefits of S/4HANA for end-users (Adshead, 2024). 70% of respondents cited lack of data skills for effective management, and 34% cited not being confident about the quality and accessibility of their organisation's data (Adshead, 2024). Given the significant statistics, we estimate that integration and compatibility issues would result in 10% loss of RISE with SAP contracts (Table 40), hence the estimated annual cost of **£435,540,000** gives it a very high risk impact.

Item	Annual Cost
RISE with SAP contract	\$1,800,000
Loss in customers due to change management	(Q2'22 - Q2'21) * 10% (20,000 - 17,000) * 0.1 = <b>300</b>
Estimated Revenue Loss (\$)	300 * \$1,800,000 = <b>\$540,000,000</b>
Estimated Revenue Loss (£)	<b>£435,540,000</b>

**Table 40: Estimated Revenue Loss due to Integration & Compatibility issues**

#### 4.3.5. Cybersecurity attacks and Breaches

**Low Impact (Score: 2).** According to IBM Data Breach Report 2023, the global average cost of data breach annually is around £3.51 million, with a 15% increase over 3 years (IBM, 2023). This makes cybersecurity attacks extremely costly as it leads to reputational damage and financial implications. Therefore, the annual cost of cybersecurity attacks is £4,036,500 with intangible costs, which gives it a low risk impact.

#### 4.3.6. Shortage of Professional Technical Talents for S/4HANA

**Medium Impact (Score: 3).** With increasing demand for technical professionals and incentives towards personal development, the global talent pool for software developers is substantial, but requires specialised training towards SAP technology stack in order to minimise the operational risk impact to the organisation. Therefore, we project that a slowdown in specialised talents would cost **£16,219,200** (Table 41), granting it a medium risk impact.

Item	Annual Cost (£)
Salary of SAP senior developer <sup>11</sup>	<b>£62,000</b>
Average number of employees	13,080
Percentage of senior developers	10%
Estimated retraining cost, 20%	$13,080 * 10\% * 62,000 * 10\% =$ <b>£16,219,200</b>
Estimated Cost to cope with Shortage of Professional Talents (£)	<b>£16,219,200</b>

**Table 41: Estimated Cost to cope with Shortage of Professional Talents**

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<sup>11</sup> The estimated base pay for senior software developer at SAP is £62,000/year (Glassdoor, 2024).

#### 4.4. Overall Rating & Risk Summary

After projecting the probability and potential impact of xx risk, we estimate the overall ratings using the EMV calculation.

$$\text{Expected Monetary Value (EMV)} = \text{Probability (0 - 1)} \times \text{Consequence (\$)}$$

Operational Risk	Highlights	Risk Probability		Impact (1-year)		EMV	Overall Rating
		%	Score (1 - 5)	Cost (£)	Score (1 - 5)		
• System downtime for cloud technology infrastructures	- Dependent on maturity progress of S/4HANA	< 2%	1	£1,744,074	2	2	Very Low
• Revenue loss to 3rd-party vendors for cloud migration	- LeanIX partnership mitigates some risk	10 - 30%	3	£1,779,160	2	6	Low
• Need for change management due to S/4HANA implementation	- Management overhead & organisational inertia - Depend on organisation's ability to change	> 50%	5	£217,660,000	4	20	Very High
• Integration & compatibility issues for S/4HANA	- Data management challenges - Customers lack business/data skills	> 50%	5	£435,540,000	5	25	Very High
• Cybersecurity attacks and breaches	- Robust cybersecurity framework - Industry knowledge mitigates some risk	< 2%	1	£4,036,500	2	2	Very Low

<ul style="list-style-type: none"> <li>• Shortage of professional technical talents</li> </ul>	<ul style="list-style-type: none"> <li>- Generic upskilling programmes may alleviate risk</li> <li>- Need for more specialised programmes</li> </ul>	> 50%	5	£16,219,200	3	15	High
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Probability	Very High (5) >50%	High (4) 30 - 50%	Medium (3) 10 - 30%	Low (2) 2 - 10%	Very Low (1) <2%
Impact	Very High (5) 80 - 100%	High (4) 60 - 80%	Medium (3) 40 - 60%	Low (2) 10 - 40%	Very Low (1) 0 - 10%
Overall Rating Table	Very High (> 20)	High (13 - 19)	Medium (7 - 12)	Low (3 - 6)	Very Low (< 2)

**Table 42: Overall Risk Ratings & EMV Matrix**

## 4.5. Potential Strategies to Mitigate Risk

According to Table 42, we intend to address the shortcomings of SAP operational risks which are highly associated with S/4HANA existing challenges.

### 4.5.1. Recommendation #1: Collaboration with Vendors & Partners

As seen through strategic partnerships with LeanIX to elevate SAP Signavio's business transformation capabilities, SAP should leverage on its vast networks to forge more strategic alliances, leveraging on their expertise and resources to develop effective coping solutions for S/4HANA migration. This reduces the need to "build solutions from scratch" and enhances the ecosystem support available for customers.

### 4.5.2. Recommendation #2: Company Case Studies

To deal with integration and compatibility challenges, as well as to provide a structured methodology for potential customers to learn more about S/4HANA technology and its challenges. SAP should publish case studies on existing S/4HANA customers, which can accelerate the maturity of S/4HANA while gaining critical insights into potential problems for developers to address.

### 4.5.3. Recommendation #3: Cross-training & Upskilling

As suggested in our proposal, the need for upskilling initiatives is mandatory for SAP to cope with the shortage of specialised IT professionals. By developing customised internal learning paths related to S/4HANA, it expands the knowledge base within SAP existing learning platform, increasing the pool of specialised talents capable of progressing to senior developer roles. Cross-skilling also encourages employee personal development, and can reduce the likelihood of brain-drain and employee turnover.

## 5. Appendices

### 5.1. SAP Consolidated Income Statement Ended December 31 2022

# Consolidated Financial Statements IFRS

#### ■ Consolidated Income Statements of SAP Group for the Years Ended December 31

€ millions, unless otherwise stated	Notes	2022	2021	2020
<b>Cloud</b>		<b>12,555</b>	<b>9,418</b>	<b>8,080</b>
Software licenses		2,056	3,248	3,642
Software support		11,909	11,412	11,506
Software licenses and support		13,965	14,660	15,148
<b>Cloud and software</b>		<b>26,521</b>	<b>24,078</b>	<b>23,228</b>
<b>Services</b>		<b>4,350</b>	<b>3,764</b>	<b>4,110</b>
<b>Total revenue</b>	(A.1), (C.2)	<b>30,871</b>	<b>27,842</b>	<b>27,338</b>
Cost of cloud		-3,853	-3,105	-2,699
Cost of software licenses and support		-1,694	-1,925	-2,008
Cost of cloud and software		-5,547	-5,030	-4,707
Cost of services		-3,388	-2,916	-3,178
<b>Total cost of revenue</b>		<b>-8,936</b>	<b>-7,946</b>	<b>-7,886</b>
<b>Gross profit</b>		<b>21,935</b>	<b>19,897</b>	<b>19,453</b>
Research and development		-6,166	-5,190	-4,454
Sales and marketing		-8,943	-7,505	-7,106
General and administration		-2,072	-2,431	-1,356
Restructuring	(B.6)	-138	-157	3
Other operating income/expense, net		54	43	84
<b>Total operating expenses</b>		<b>-26,200</b>	<b>-23,186</b>	<b>-20,715</b>
<b>Operating profit</b>		<b>4,670</b>	<b>4,656</b>	<b>6,623</b>
<b>Other non-operating income/expense, net</b>	(C.3)	<b>-195</b>	<b>17</b>	<b>-179</b>
Finance income		820	3,123	1,473
Finance costs		-2,205	-949	-697
<b>Financial income, net</b>	(C.4)	<b>-1,385</b>	<b>2,174</b>	<b>776</b>
<b>Profit before tax</b>	(C.2)	<b>3,090</b>	<b>6,847</b>	<b>7,220</b>
Income tax expense	(C.5)	-1,382	-1,471	-1,938
<b>Profit after tax</b>		<b>1,708</b>	<b>5,376</b>	<b>5,283</b>
Attributable to owners of parent		2,284	5,256	5,145
Attributable to non-controlling interests		-576	121	138
<b>Earnings per share, basic (in €)</b>	(C.6)	<b>1.95</b>	<b>4.46</b>	<b>4.35</b>
<b>Earnings per share, diluted (in €)</b>	(C.6)	<b>1.94</b>	<b>4.46</b>	<b>4.35</b>

The accompanying Notes are an integral part of these Consolidated Financial Statements.

## 5.2. SAP Consolidated Balance Sheet Ended December 31 2022

### **Consolidated Statements of Financial Position of SAP Group as at December 31**

	Notes	2022	2021
€ millions			
Cash and cash equivalents	(E.3)	9,008	8,898
Other financial assets	(D.6), (E.3)	853	2,758
Trade and other receivables	(A.2)	6,236	6,352
Other non-financial assets	(A.3), (G.1)	2,139	1,633
Tax assets		287	403
<b>Total current assets</b>		<b>18,522</b>	<b>20,044</b>
Goodwill	(D.2)	33,106	31,089
Intangible assets	(D.3)	3,835	3,965
Property, plant, and equipment	(D.4), (D.8)	4,934	4,977
Other financial assets	(D.6), (E.3)	5,626	6,275
Trade and other receivables	(A.2)	169	147
Other non-financial assets	(A.3), (G.1)	3,580	2,628
Tax assets		323	263
Deferred tax assets	(C.5)	2,065	1,786
<b>Total non-current assets</b>		<b>53,638</b>	<b>51,130</b>
<b>Total assets</b>		<b>72,159</b>	<b>71,174</b>
Trade and other payables		2,146	1,580
Tax liabilities		283	304
Financial liabilities	(E.3), (D.5)	4,808	4,528
Other non-financial liabilities	(B.3), (B.5), (G.2)	4,818	5,203
Provisions	(A.4), (B.4), (B.5), (B.6)	90	89
Contract liabilities	(A.1)	5,309	4,431
<b>Total current liabilities</b>		<b>17,453</b>	<b>16,136</b>
Trade and other payables		79	122
Tax liabilities		893	827
Financial liabilities	(E.3), (D.5)	9,547	11,042
Other non-financial liabilities	(B.3), (B.5), (G.2)	705	860
Provisions	(A.4), (B.4), (B.5), (B.6)	359	355
Deferred tax liabilities	(C.5)	241	296
Contract liabilities	(A.1)	33	13
<b>Total non-current liabilities</b>		<b>11,858</b>	<b>13,515</b>
<b>Total liabilities</b>		<b>29,311</b>	<b>29,651</b>
Issued capital		1,229	1,229
Share premium		3,081	1,918
Retained earnings		36,418	37,022
Other components of equity		3,801	1,756
Treasury shares		-4,341	-3,072
<b>Equity attributable to owners of parent</b>		<b>40,186</b>	<b>38,853</b>
<b>Non-controlling interests</b>	(E.2)	<b>2,662</b>	<b>2,670</b>
<b>Total equity</b>	(E.2)	<b>42,848</b>	<b>41,523</b>
<b>Total equity and liabilities</b>		<b>72,159</b>	<b>71,174</b>

The accompanying Notes are an integral part of these Consolidated Financial Statements.

### 5.3. SAP Consolidated Cash Flow Ended December 31 2022

**Consolidated Statements of Cash Flows of SAP Group for the Years Ended December 31**

€ millions	Notes	2022	2021	2020
<b>Profit after tax</b>		<b>1,708</b>	<b>5,376</b>	<b>5,283</b>
Adjustments to reconcile profit after tax to net cash flow from operating activities:				
Depreciation and amortization	(D.2)–(D.4)	1,896	1,775	1,831
Share-based payment expenses	(B.3)	2,614	2,794	1,084
Income tax expense	(C.5)	1,382	1,471	1,938
Financial income, net	(C.4)	1,385	-2,174	-776
Decrease/increase in allowances on trade receivables		90	-11	68
Other adjustments for non-cash items		-173	39	-198
Decrease/increase in trade and other receivables		149	414	821
Decrease/increase in other assets		-1,312	-706	-651
Increase/decrease in trade payables, provisions, and other liabilities		163	475	293
Increase/decrease in contract liabilities		685	100	128
Share-based payments	(B.3)	-1,182	-1,120	-1,310
Interest paid		-248	-202	-244
Interest received		166	56	122
Income taxes paid, net of refunds		-1,675	-2,063	-1,194
<b>Net cash flows from operating activities</b>		<b>5,647</b>	<b>6,223</b>	<b>7,194</b>
Cash flows for business combinations, net of cash and cash equivalents acquired		-679	-1,142	-662
Cash flows from sale of subsidiaries or businesses		289	-72	203
Purchase of intangible assets and property, plant, and equipment		-874	-800	-816
Proceeds from sales of intangible assets or property, plant, and equipment		60	91	88
Purchase of equity or debt instruments of other entities		-2,320	-4,368	-2,535
Proceeds from sales of equity or debt instruments of other entities		4,190	3,229	735
<b>Net cash flows from investing activities</b>		<b>667</b>	<b>-3,063</b>	<b>-2,986</b>
Dividends paid	(E.2)	-2,865	-2,182	-1,864
Dividends paid on non-controlling interests		-12	-54	-2
Purchase of treasury shares	(E.2)	-1,500	0	-1,492
Proceeds from changes in ownership interests in subsidiaries that do not result in the loss of control		33	2,828	95
Payments for taxes related to net share settlement of equity awards	(B.3)	-282	0	0
Proceeds from borrowings	(E.3)	158	1,680	2,132
Repayments of borrowings	(E.3)	-1,445	-1,952	-2,430
Payments of lease liabilities		-424	-374	-378
Transactions with non-controlling interests	(E.2)	0	-2	-59
<b>Net cash flows from financing activities</b>		<b>-6,337</b>	<b>-56</b>	<b>-3,997</b>
<b>Effect of foreign currency rates on cash and cash equivalents</b>		<b>134</b>	<b>484</b>	<b>-214</b>
<b>Net decrease/increase in cash and cash equivalents</b>		<b>109</b>	<b>3,587</b>	<b>-4</b>
<b>Cash and cash equivalents at the beginning of the period</b>	(E.3)	<b>8,898</b>	<b>5,311</b>	<b>5,314</b>
<b>Cash and cash equivalents at the end of the period</b>	(E.3)	<b>9,008</b>	<b>8,898</b>	<b>5,311</b>

The accompanying Notes are an integral part of these Consolidated Financial Statements.

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