

2022 Market Analysis Results

CIMdata PLM Market & Industry Forum

2022 Market Analysis Results
PLM Market & Industry Forum
A CIMdata PLM Leadership Event
5 April 2022

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Global Leaders in PLM Consulting
www.CIMdata.com

#plm4um

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Our Mission...

Strategic management consulting for competitive advantage in global markets

CIMdata is the leading independent global strategic management consulting and research authority focused exclusively on PLM and the digital transformation it enables.

We are dedicated to maximizing our clients' ability to design, deliver, and support innovative products and services through the application of PLM.

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Purpose of this Presentation

A CIMdata disclaimer

- Deliver an overview of CIMdata's analysis of the PLM market for calendar year 2021
- Present our estimates of direct provider revenues by various categories
- Provide insight into investment changes, trends and market leaders
- Obtain provider input as to the PLM analytics they would like CIMdata to develop
- A detailed analysis of this research will be provided in CIMdata's 2022 PLM Market Analysis Report series
- All information represent CIMdata's estimates of revenues and investments

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Important Notes

How CIMdata prepares the global MAR data

- CIMdata's estimates are for calendar year 2021 and may differ from a provider's fiscal year reported financials
- The relative strength of different currencies can impact growth estimates – all estimates are based on the yearly average for conversion of a currency to US dollars
- All estimates are net of royalties to eliminate any double counting of revenues
 - The royalty paid by a reseller is deducted from their revenue estimate and included within the direct revenues of the appropriate provider's estimate
- There are many acquisitions in some segments that could affect some numbers in 2021
 - We will note those during the presentation

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Agenda

2022 CIMdata PLM Market & Industry Forum

- PLM Market Analysis
- Overall cPDM Market Analysis
- PLM Provider Analysis
- Provider Sector Analysis
- Concluding Remarks

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Research Methodology Overview

How CIMdata gathers PLM market data each year

- Gather data through multiple means
 - Nearly 550 companies get survey workbooks via email
 - Repeated reminders increase response rate
 - Approximately 30 of the world's largest PLM companies interviewed each year
 - Often multiple times to get more insights
 - Separate research conducted in China and Japan
 - Public reporting and other market research used for data collection and cross-check, e.g., Electronic System Design Alliance (formerly EDA Consortium)
 - CIMdata global contacts used as "sanity checks" on anomalous inputs
- Total of approximately 700 companies "touched" by CIMdata process

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Currency Fluctuations Important

Revenues most often reported in USD, Euros, and Japanese Yen

Currency	2020	2021	YoY Change
Euro To US Dollar	1.138952164	1.182657	-3.84%
Pound To US Dollar	1.282051282	1.375573	-7.29%
Japanese Yen To US Dollar	0.009374531	0.0091103	2.82%
Swiss Franc To US Dollar	1.064962726	1.094061	-2.73%
Chinese Yuan To US Dollar	0.144906535	0.154885	-6.89%
Korean Won To US Dollar	0.000847366	0.000874	-3.14%
Swedish Krona To US Dollar	0.108577633	0.116592	-7.38%
Brazilian Real To US Dollar	0.18	0.186181	-3.43%
Indian Rupee To US Dollar	0.013495277	0.013553	-0.43%
Australian Dollar To US Dollar	0.687757909	0.751042	-9.20%
Norwegian Krone To US Dollar	0.106236057	0.116394	-9.56%

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Acquisitions in 2021

Some big, many tuck-ins but still at a high rate, 197 overall (1 of 4)

- Autodesk acquired Innovyze, Upchain, and ProEst
- Centric Software added Armonica
- IBM added McD Tech Labs and SXiQ
- PTC acquired Migenius and completed the Arena acquisition
- Siemens acquired OneSpin Solutions IC, Fractal Technologies, SupplyFrame, NextFlow Software, PRODESIGN Electronic GmbH, and FORAN; Mentor Polska with UltraSOC Poland

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Acquisitions in 2021

Some big, many tuck-ins but still at a high rate, 197 overall (2 of 4)

- Altair added Flow Simulator, S_FRAME Software, and World Programming
- Ansys acquired Phoenix Integration and Zemax LLC
- Gamma Technologies added Exothermia
- Hexagon added 4, CADLM, Immersal Oy, Jovix, and Infor's EAM business
- Rockwell Automation acquired Plex and AVATA
- Sandvik added 9, including Cimatron, CNC Software, ICAM CAM

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Acquisitions in 2021

Some big, many tuck-ins but still at a high rate, 197 overall (3 of 4)

- Cadence acquired NUMECA, and Pointwise (both CFD)
- Synopsys added MoreThanIP, Code DX, BISTel, and Concertio
- Accenture continued its buying spree with 50(!), six in Industry X practice
 - Pollux, Electro 80, **umlaut**, **DI Square**, T.A. Cook, and Advoco
- Atos with 12, two in PLM: Processia and IDEAL GRP
- Capgemini with 6, three in Australia, cloud, and cybersecurity
- Wipro acquired Capco and Ampion

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Acquisitions in 2021

Some big, many tuck-ins but still at a high rate, 197 overall (4 of 4)

- Aspen Technology now “New AspenTech” adding some assets from Emerson
- Bentley Systems (10), including Seequent (2), sensemetrics, and Vista Data Vision
- IFS added Axios Systems and Customerville
- Infor acquired Lighthouse Systems
- Lectra acquired Gerber Technologies
- Microsoft added Nuance Communications, Inc.
- Xometry acquired Thomas



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Thomas Register

Long cycle of creative destruction – 1898 to today, merged with this era’s “catalog” Xometry

The screenshot shows the Xometry website interface. At the top left is the Xometry logo. To its right are navigation links: "Sign In →", "Book a Demo", and "Get Your Instant Quote". Below the logo is a horizontal menu with "Capabilities", "Industries", "Resources", "Supplies", and "Become a Supplier". A search bar contains the text "Try CNC Machining". The main content area is a grid of manufacturing capabilities:

CNC	Sheet Cutting	Sheet Metal Forming	3D Printing	Injection Molding	Other Services
CNC Machining	Sheet Cutting	Sheet Metal Fabrication	3D Printing Service	Plastic Injection Molding	Urethane Casting
CNC Milling	Laser Cutting		Carbon DLS	Insert Molding	Die Casting
CNC Turning	Waterjet Cutting		Fused Deposition Modeling	Overmolding	Rapid Prototyping
	Plasma Cutting		HP Multi Jet Fusion	Prototype Molding	High-Volume Production
			Polyjet	Bridge Tooling	Assembly Services
			Selective Laser Sintering	Production Tooling	
			Stereolithography		
			Metal 3D Printing Service		
			Direct Metal Laser Sintering		
			Metal Binder Jetting		
			Vapor Smoothing 3D Prints		

At the bottom of the screenshot, a quote reads: "...a multi-volume directory of industrial product information covering distributors, manufacturers and service companies".



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Changes in Market Sample

Looking to cover more and more of the overall PLM market

- None of the acquisitions will affect the overall market results
 - Of course, acquisitions will affect the results of individual companies
 - E.g., Accenture growth from 2019-2021 acquisitions
 - Compensate for acquisitions by adjusting un-allocated revenues
- Will follow up in next year's process to see if any of the acquisitions are contributing to their PLM business
- Beyond acquisitions, in any given year we may add several other companies
- For 2021, there were no major additions that affect the reported results

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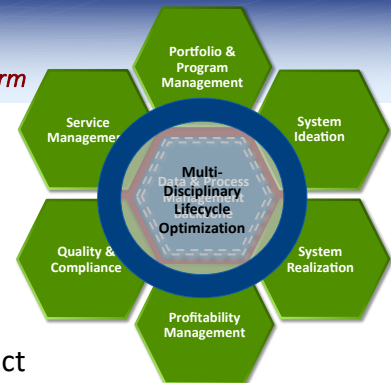
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PLM – CIMdata's Definition

Digital transformation of the lifecycle—enabled by a product innovation platform

- Strategic business approach
 - **NOT** just technologies
 - Consistent set of business solutions
- Collaborative creation, use, management & dissemination of product related *intellectual assets*
 - All product/plant definition information – the virtual product
 - AEC, MCAD, EDA, ALM, SE, requirements, simulations, analytics, portfolio, formulas...
 - All product/plant process definitions – the virtual processes
 - Processes that plan, design, produce, operate, support, decommission, recycle...
- An innovation platform that supports the extended enterprise
- Spans the full lifecycle, from idea/concept through life



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PLM Market Categories

Three major segments comprise the PLM Market

- collaborative Product Definition management
 - Applications and solutions to capture, manage, disseminate, visualize and collaborate on product related intellectual (digital/virtual) information, including related processes
- Tools
 - Applications that are used to create intellectual assets
 - Authoring, analysis, modeling, simulation and documentation of product and plant/facility information
- Digital Manufacturing
 - Process planning, resource definition, factory floor layout and product flow simulation and analysis (including ergonomics)

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Overall PLM Results

Growth in 2021 over forecast

- Overall PLM growth (10.7%) above forecast (7.5%)
- Autodesk and PTC license model transition positively affects certain segments
- Continued industry consolidation, new entrants, investor interest and action
 - SI/Reseller/VAR the most active segment, led by Accenture (again)
 - Major PLM players trying to differentiate, expand reach

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2021 Market Results

Results by segment (US\$ Millions) are positive

Segment	2021 Revenues	YoY Growth
cPDM Comprehensive Technology Providers	\$7,721.5	11.1%
cPDM-Focused Applications	\$2,840.3	6.5%
Digital Manufacturing	\$873.9	4.9%
SI/Reseller/VAR	\$8,393.7	6.2%
Tools		
MCAD-Multi-Discipline	\$3,993.0	3.9%
MCAD-Design-Focused	\$3,941.8	11.3%
Non-Bundled CAM	\$1,529.0	5.0%
Simulation & Analysis	\$8,184.1	9.5%
Other Tools (e.g., ALM)	\$1,952.6	8.7%
EDA	\$13,306.4	16.0%
AEC	\$6,457.0	16.6%
Total	\$59,193.2	10.7%

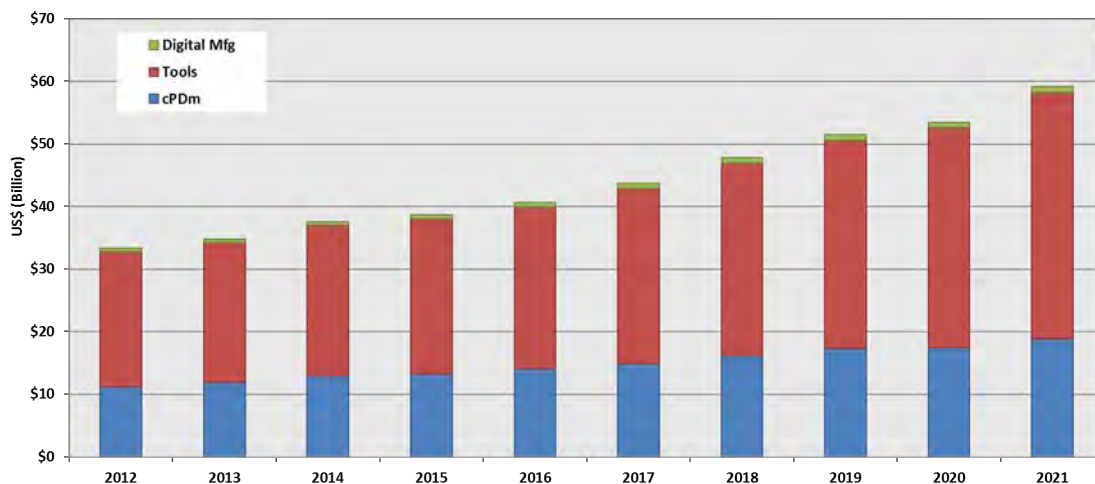
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PLM Market Investment

Spend increased during 2021



Revenues presented are CIMdata estimates

PLM up 10.7% – \$59.2 billion

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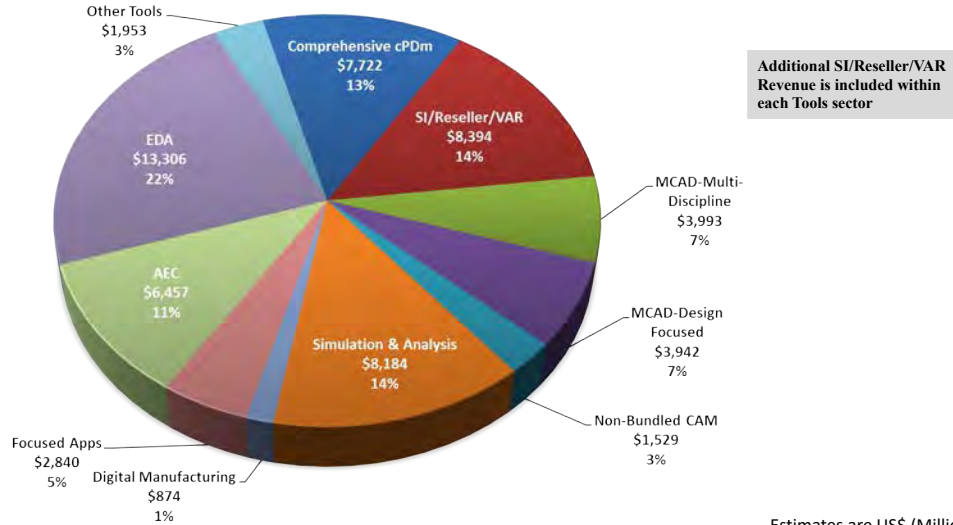
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PLM Investments by Segment

Market grew by 10.7% to US\$59.2 Billion in 2021



Revenues presented are CIMdata estimates

Estimates are US\$ (Millions)

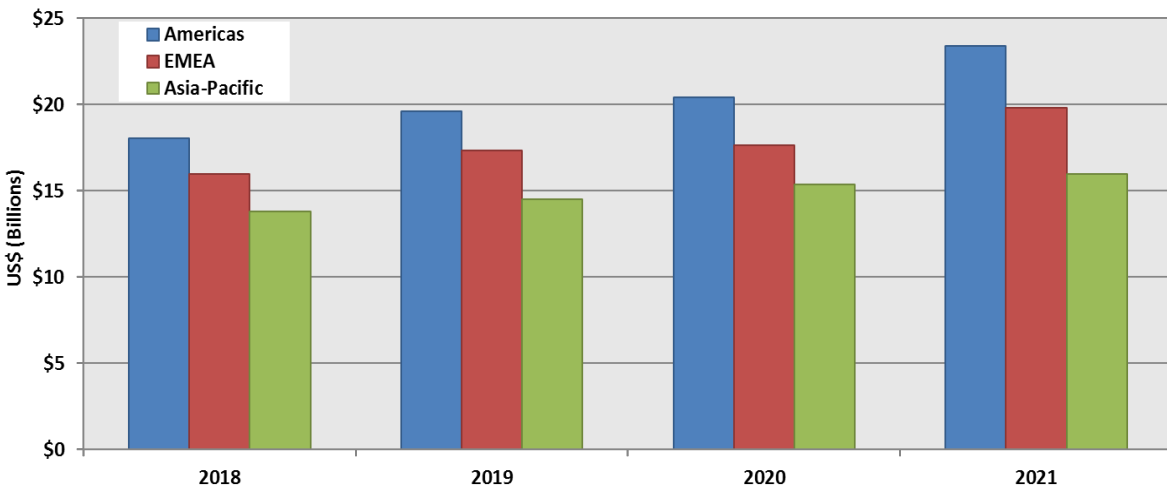


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PLM Geographic Distribution

History of investment by geography



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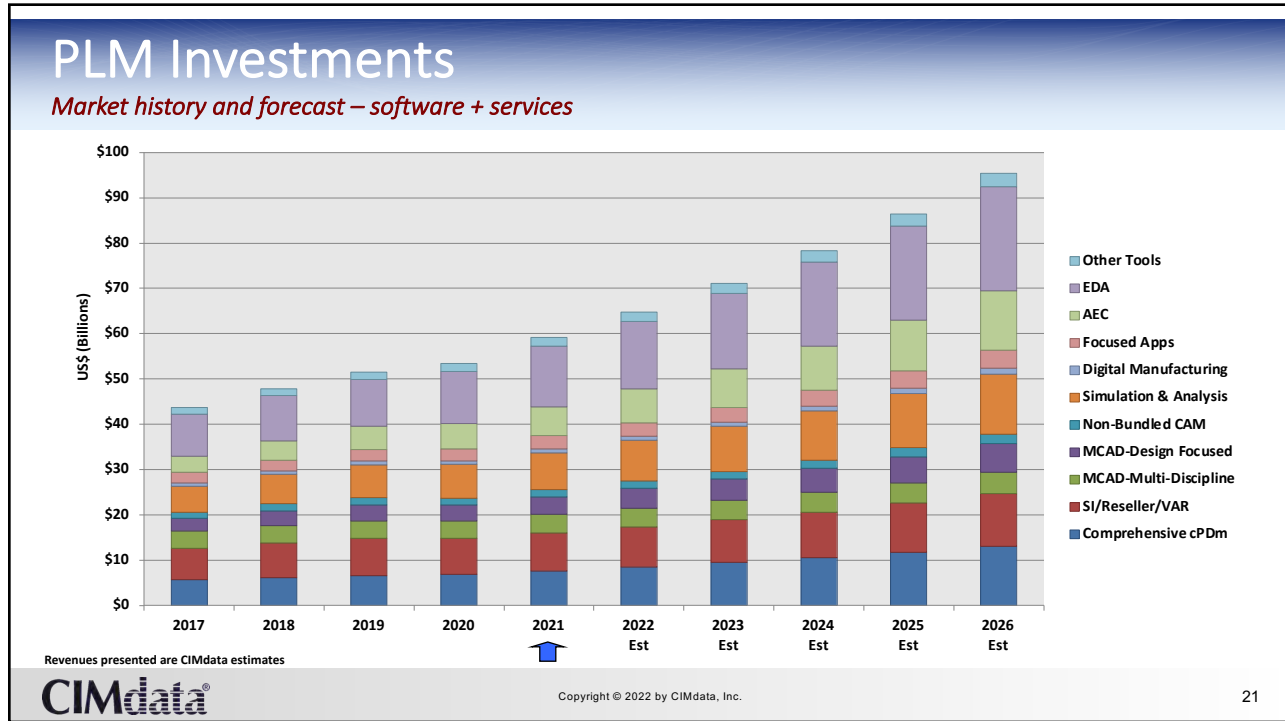


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PLM Market in 2022

Big IT changes on-going, global economic growth stopped in its tracks by COVID-19

- What does 2021 mean for the coming years?
- Still seems to be appetite for M&A
- CIMdata believes the market still has a lot of potential

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Market Forecasts

For 2022 (US\$ Millions) and 5-year compound annual growth rate (CAGR)

Segment	2022 Estimate	YoY Growth	5 Year CAGR
cPDM Comprehensive Technology Providers	\$8,562.74	10.9%	11.2%
cPDM-Focused Applications	\$3,029.71	6.7%	7.5%
Digital Manufacturing	\$932.46	6.7%	7.2%
SI/Reseller/VAR	\$8,877.19	5.8%	6.7%
Tools			
MCAD-Multi Discipline	\$4,116.80	3.1%	3.2%
MCAD-Design Focused	\$4,324.13	9.7%	9.9%
Non-Bundled CAM	\$1,610.80	5.4%	6.2%
Simulation & Analysis	\$8,953.37	9.4%	10.2%
Other Tools (e.g., ALM)	\$2,106.84	7.9%	7.9%
EDA	\$14,903.18	12.0%	11.6%
AEC	\$7,386.77	14.4%	15.0%
Total	\$64,803.99	9.5%	10.0%



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cPDm Segment of the PLM Market

cPDm is a core element of a PLM environment

- Managing intellectual assets
 - Management of product information and processes
 - Workflow, vaulting, content, document management
 - Visualization and collaboration
 - Product structure
 - Configuration and change management
 - Strategic product planning
 - Project and program management
 - Compliance and sourcing
 - Others

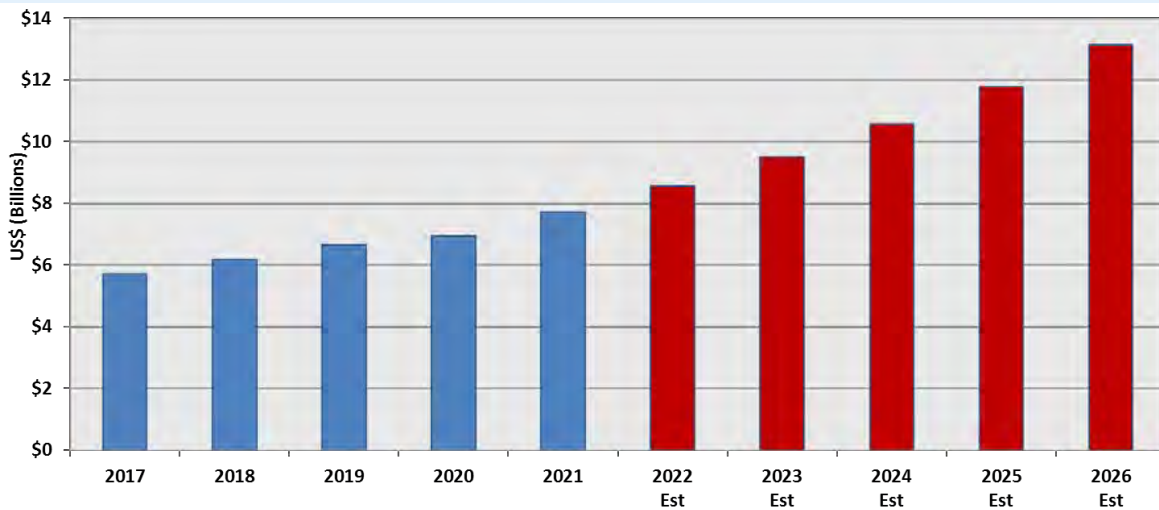


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2021 cPDm Revenue Distribution

Total investment = software + services – Five-year CAGR estimate = 11.2%



Revenues presented are CIMdata estimates



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Revenue Ratios – Software vs. Services

Services is a major revenue area

- Overall cPDM market: services are 55.3%
 - Driven by independent services providers
- Comprehensive cPDM providers
 - In 2021, Software was 72.3% vs. 27.7% for Services
 - In 2020, Software was 70.8% vs. 29.2% for Services
- Services ratio can change for several reasons
 - PLM solution providers developing products, packaging, and delivery bundles to reduce services
 - Cloud-based products often claim to require less services
 - Nature of services changing – more need for skills in advanced PLM topics vs. IT installation and integration

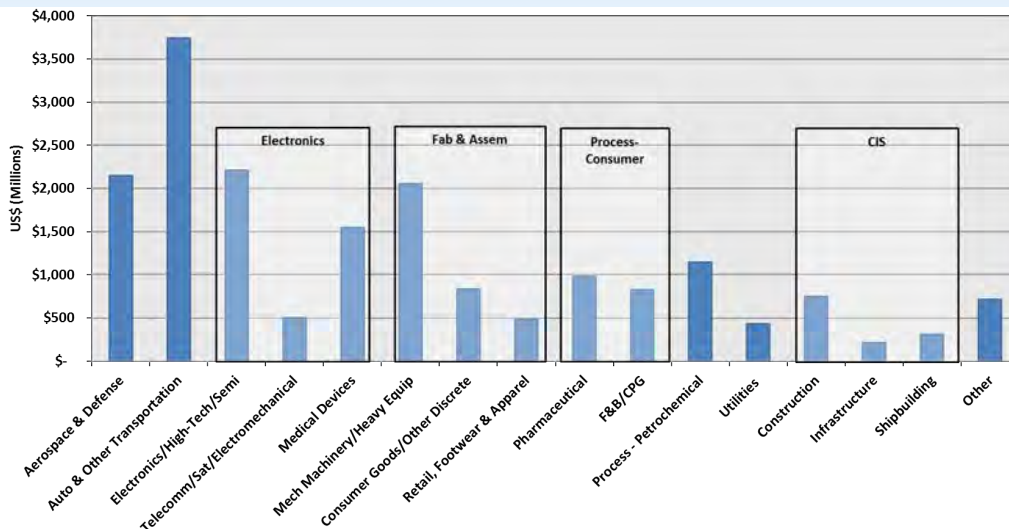


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2021 cPDM Investment

Investments by industry



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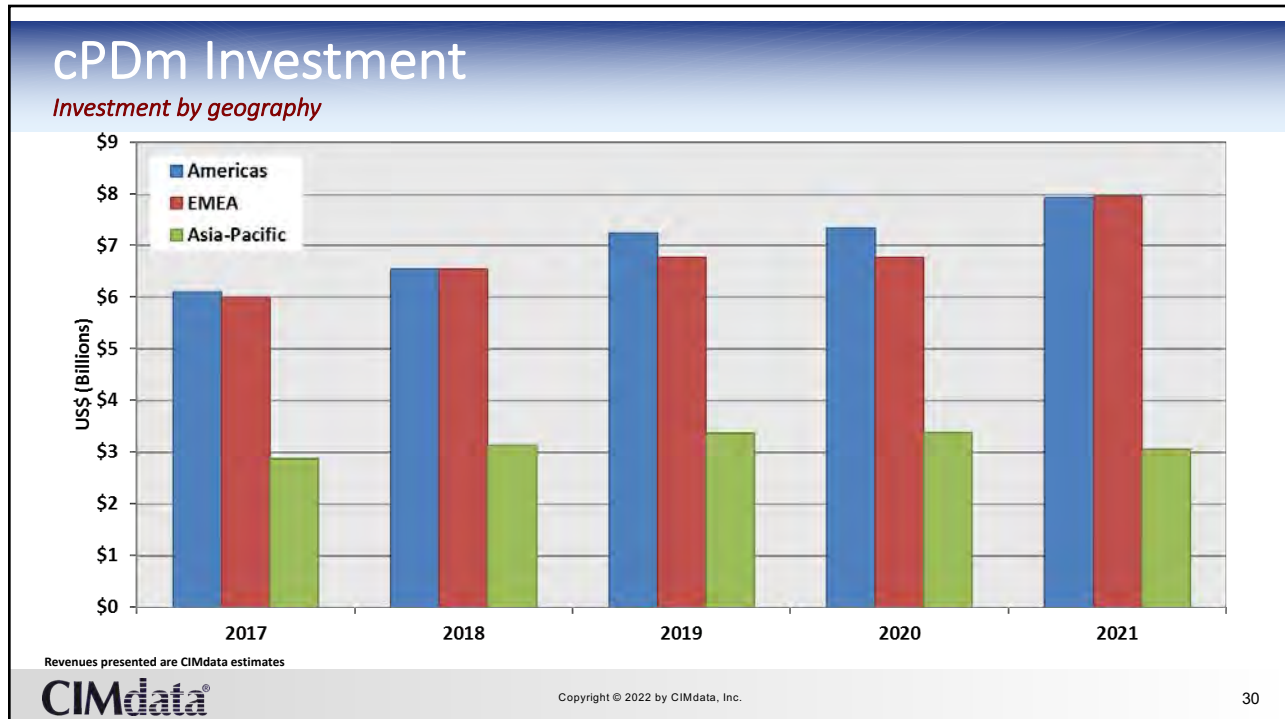
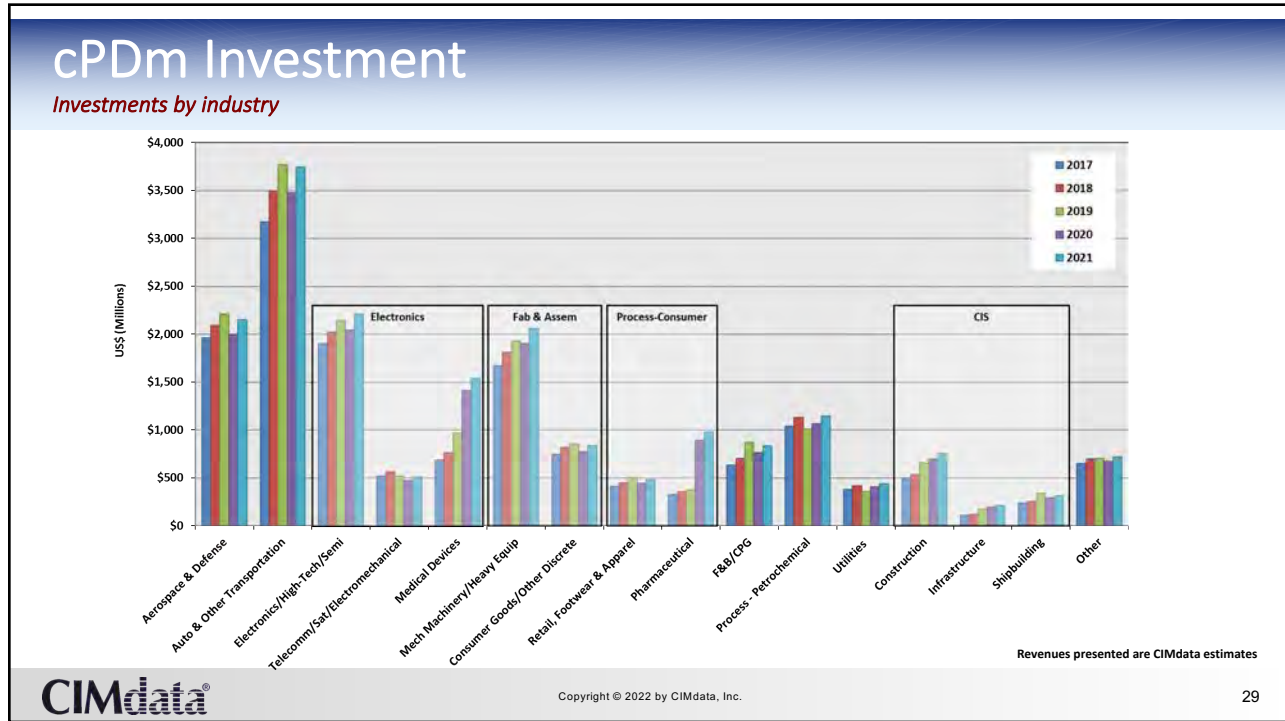


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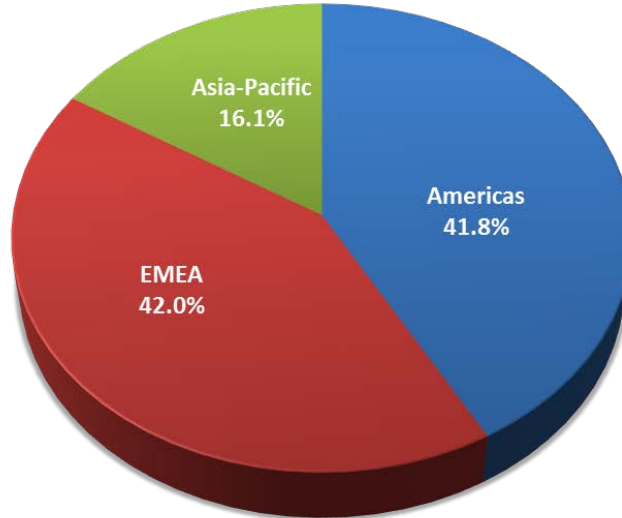


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2021 cPDM Geographic Distribution

Growth in the Americas and EMEA, slight dip in Asia-Pacific



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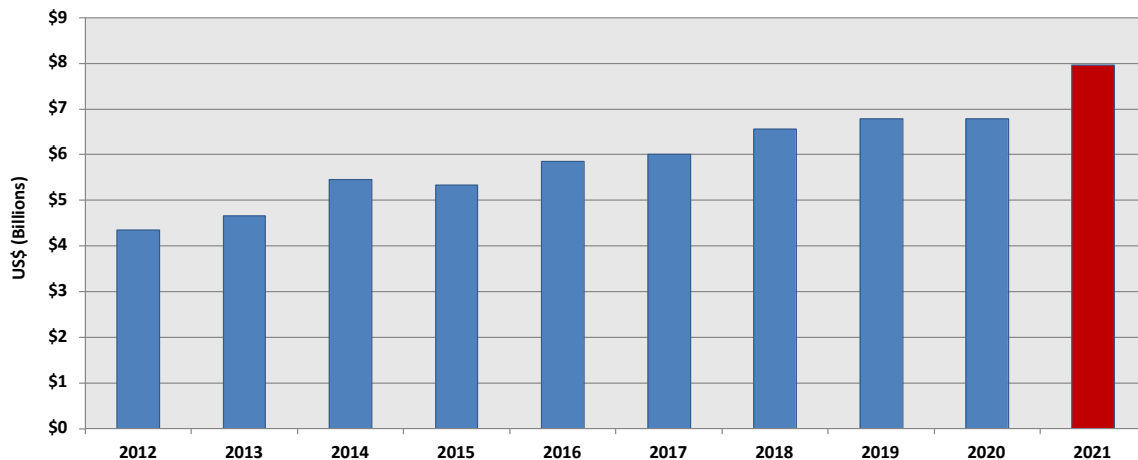
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2021 EMEA cPDM Revenue History

Strong growth in CY 2021



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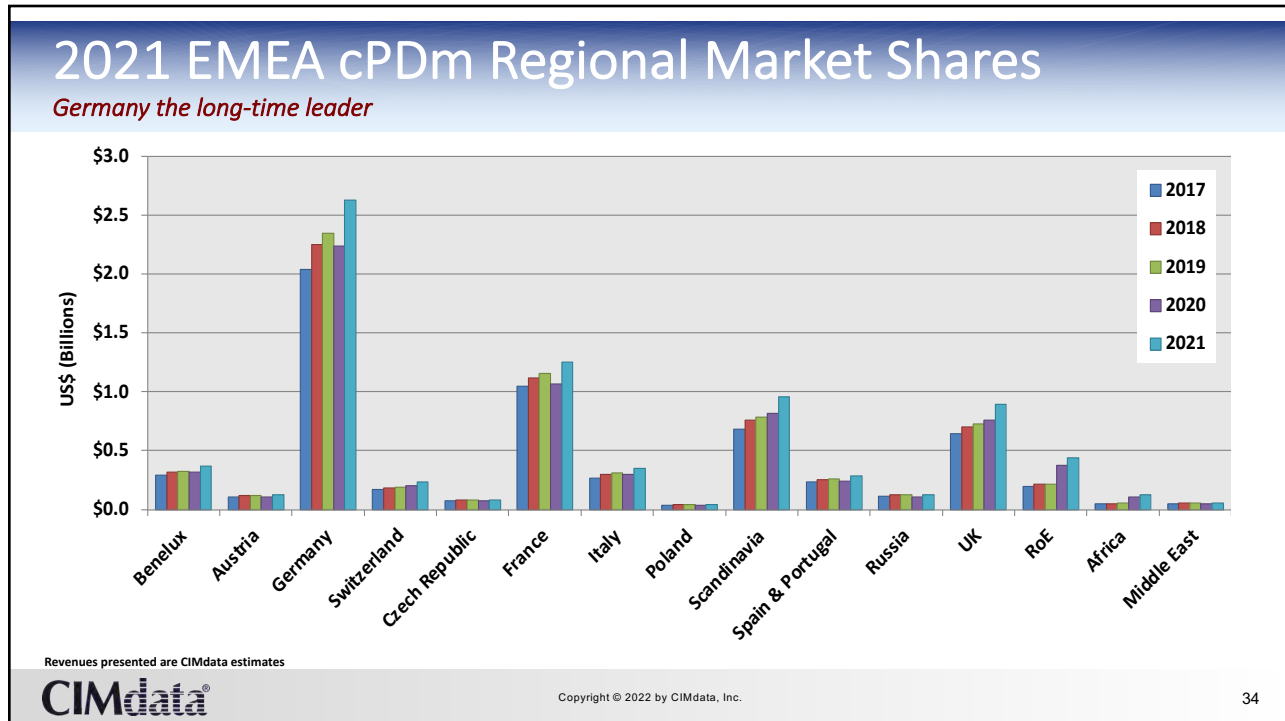
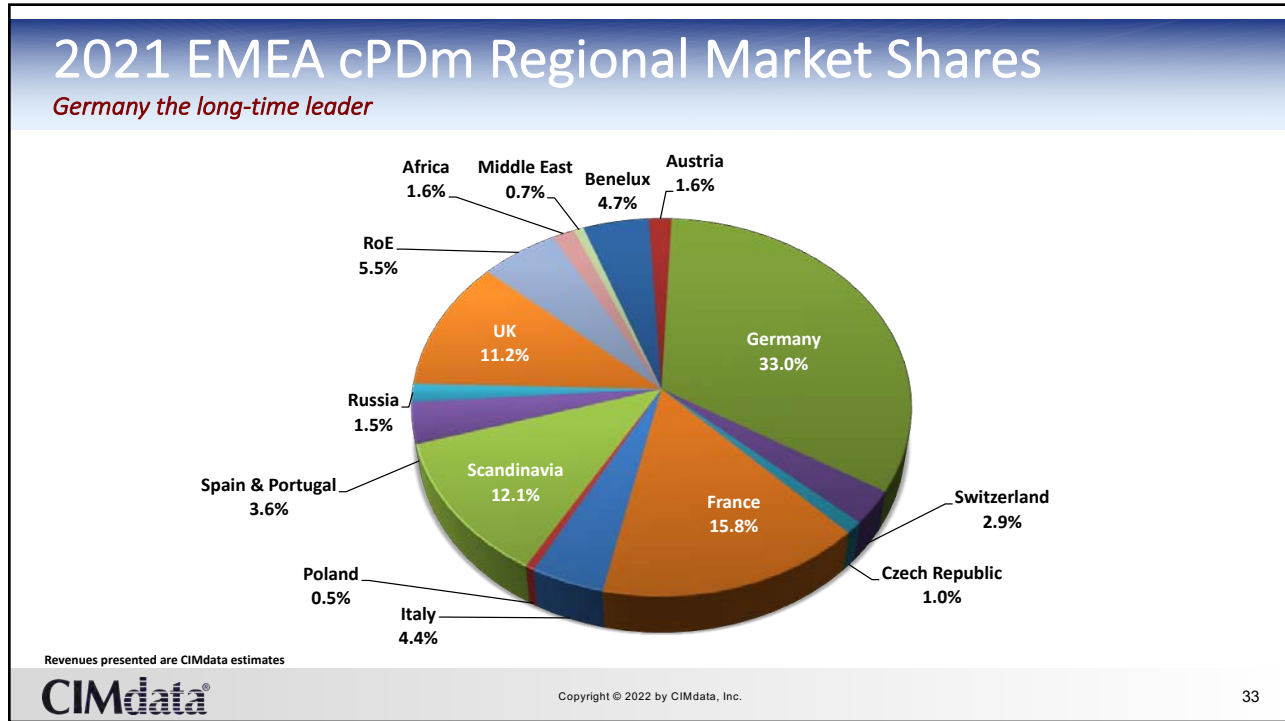
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PLM Mindshare Leaders

Who do people think about?

- These companies are perceived as leading the market
 - Number, size, and scope of implementations
 - Technology and thought leadership
- All are comprehensive, lifecycle-focused providers
 - Some were leaders in the PDM market
 - Some also provide tools – primarily MCAD and S&A
- Are developing broad PLM platforms, and addressing new industries and geographies

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Market Presence

Evaluating a provider's impact in the marketplace

- Market presence includes
 - A provider's direct revenues
 - Partner revenues built around a provider's products and technology
 - Does not double count royalties paid
- Represents a provider's overall footprint in the PLM market
- Grows with a provider's partnerships and alliances

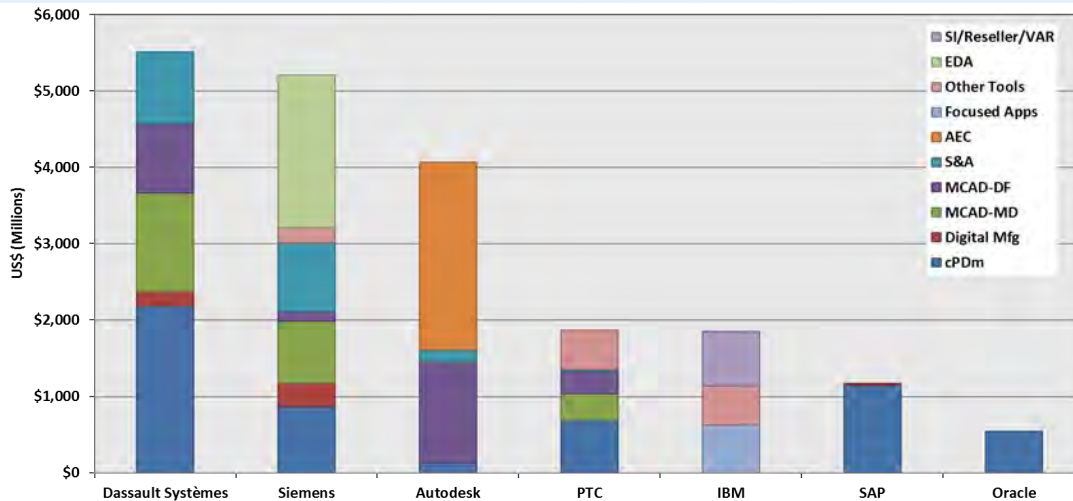


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2021 PLM Mindshare Leaders Revenue

Leaders' direct revenues—led by providers of CAD tools



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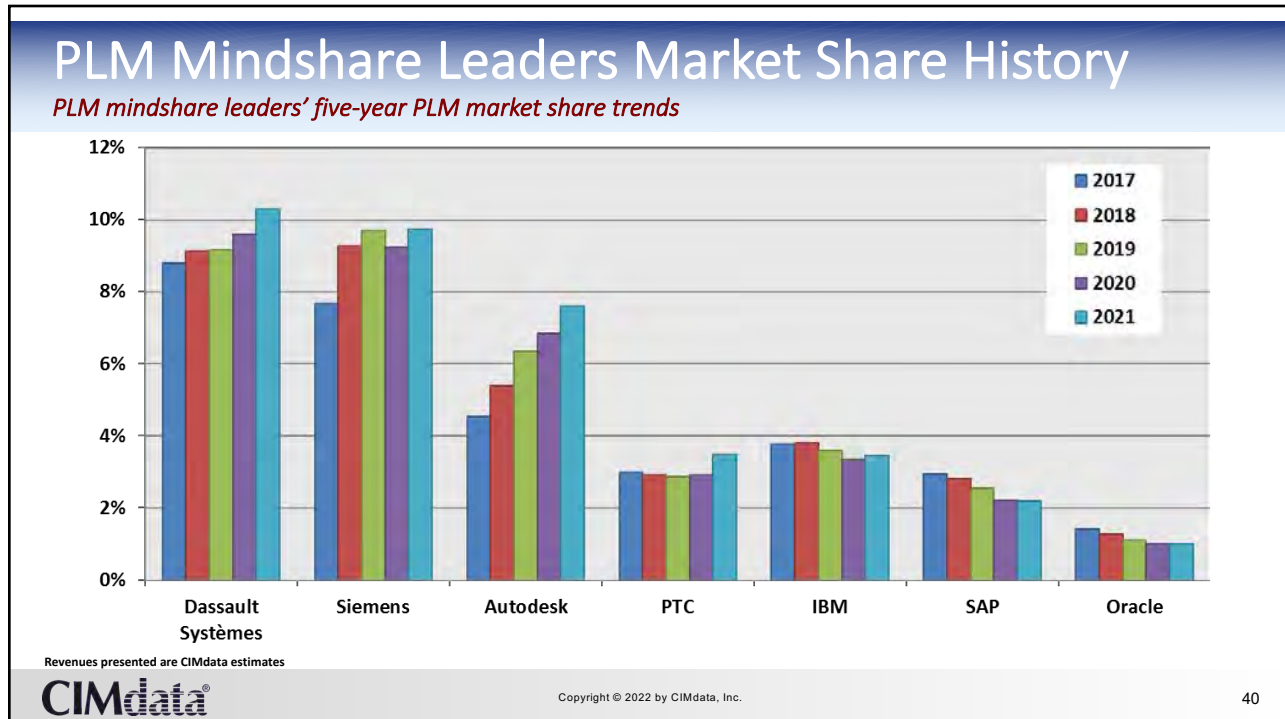
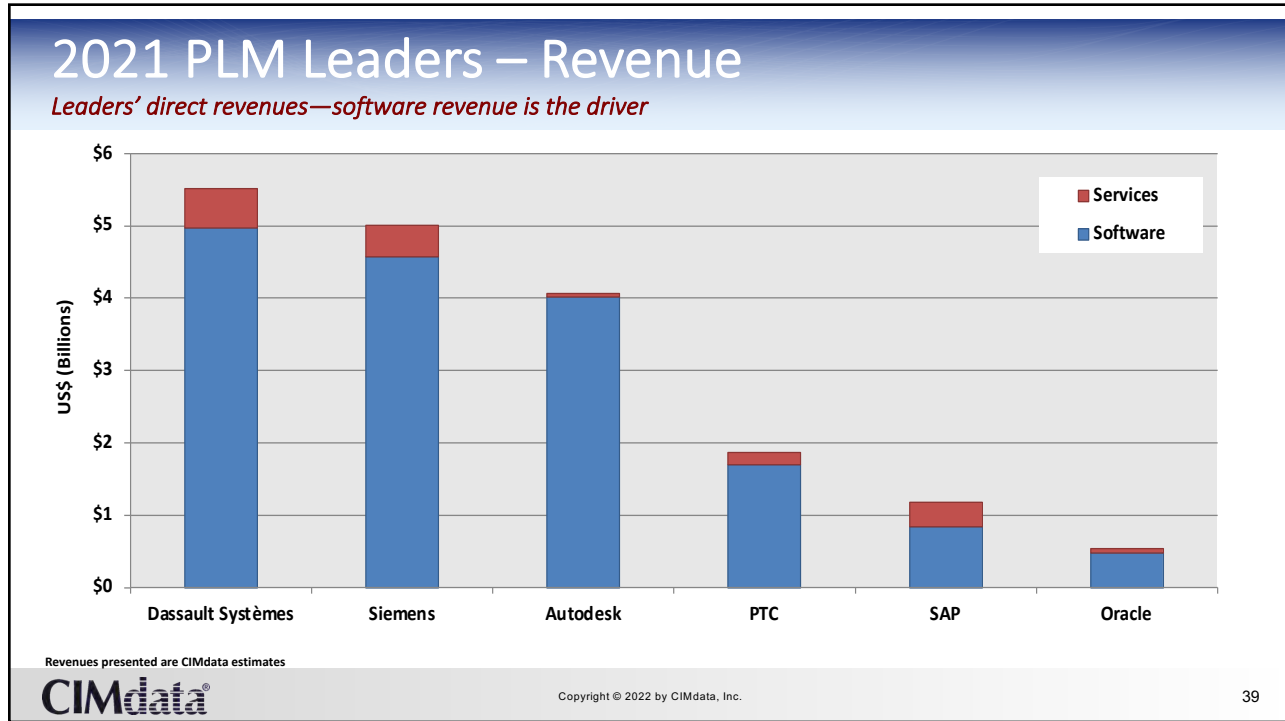


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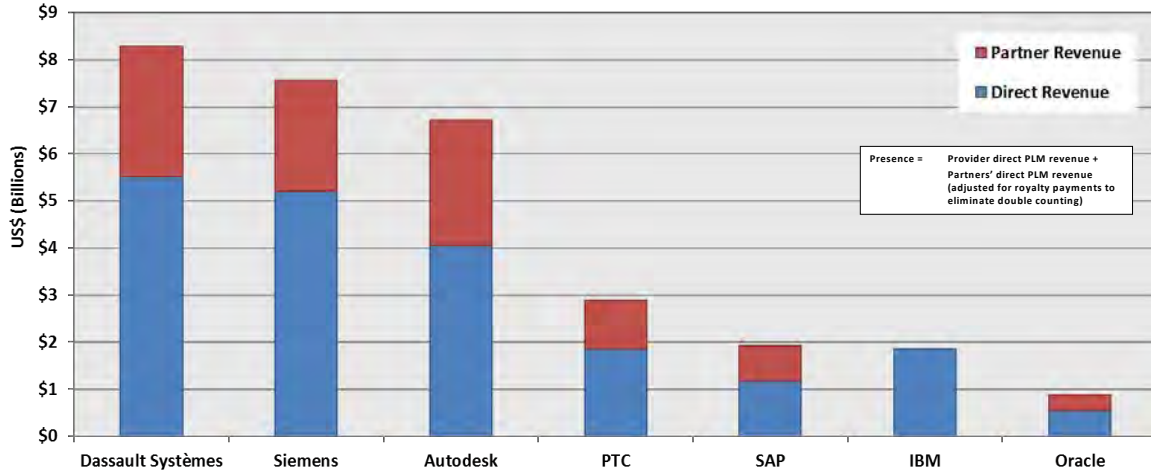


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2021 PLM Mindshare Leaders Presence

PLM leaders' footprints in industry—heavily leveraging partners



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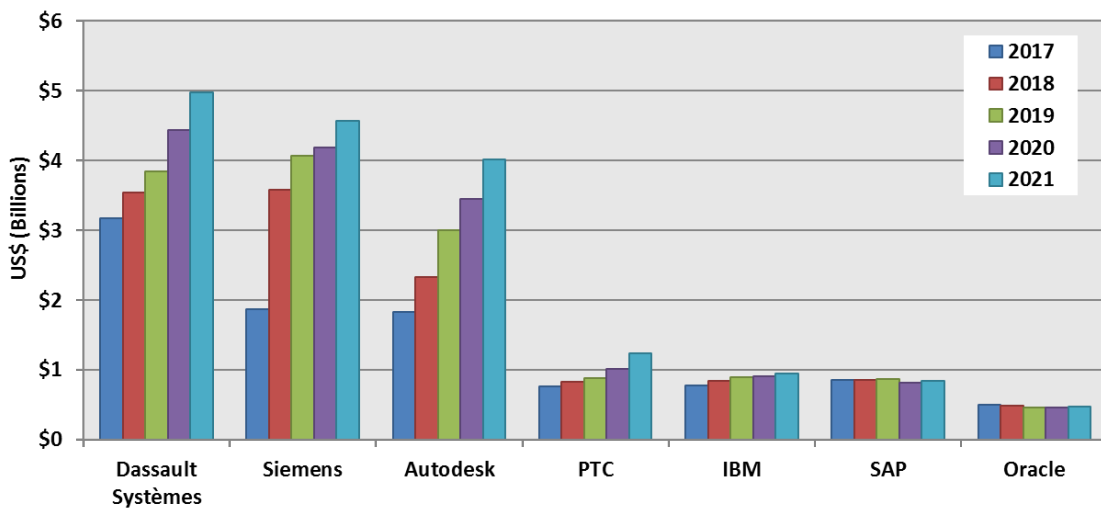


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PLM Leaders Software History

Leaders' five-year PLM direct revenue trends – software only



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Overall PLM Market Revenue Leaders

The market leaders are a diverse group

- Several are focused on specific technologies or industries
 - MDA, EDA, AEC, analysis, ...
- Some have multiple lines of business
- Some are partners of multiple other providers
- Many are not competitors
- Thirteen companies over \$1 billion in revenue
 - Two EDA
 - Five Comprehensive cPDM
 - Two SI/Reseller/VAR
 - Two S&A
 - One Focused cPDM
 - And Hexagon

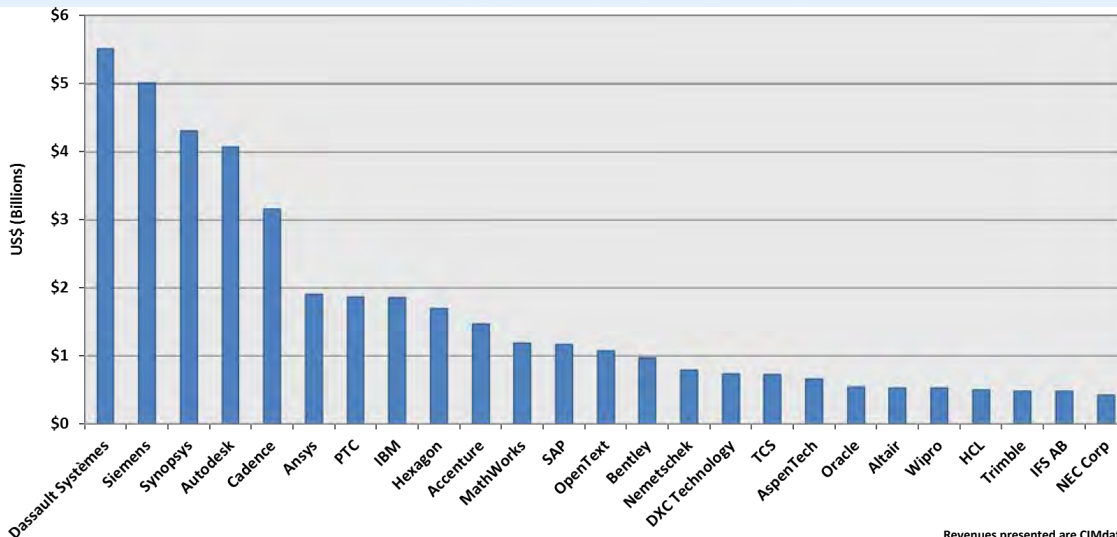


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2021 Overall PLM Revenue Leaders

Many diverse companies generate PLM revenue



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Scope of Services Continues to Evolve

As PLM solutions evolve, more and different services are needed—even more of a challenge now

- PLM continues to interface, exchange information and processes with more and more business solutions
 - Expanding footprint, support for digital thread requires higher levels of integration
 - PLM expansion areas require deployment skills not normally available in-house – driving use of external expertise
 - Cloud – cloud-to-cloud, cloud-to-on-premise interconnection
 - IoT data will have to be analyzed, with results fed back to multiple systems
- Changes to software design, packaging, and delivery changing the types of services needed
 - Going beyond just implementation, IT integration
 - Helping customers to implement advanced topics/processes using a specific cPDM solution
 - Mobile access to multiple systems of record



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Service Providers

Services companies continue to increase PLM commitments

- Systems integrators and consultancies continuing their PLM program expansion
 - Global firms
 - Accenture, Atos, Capgemini, IBM, T-Systems, CENIT, DXC Technology, Deloitte, Tata Technologies, TCS, HCL, Infosys, Wipro, Tech Mahindra,...
 - Regional/focused SIs continue expanding
 - NEC, Addnode, Samsung SDS,...
- These firms are developing solutions on top of solution provider technology
 - Adding their domain expertise
 - Industry and/or functional solutions
 - Selling through vendors or direct to industrial companies



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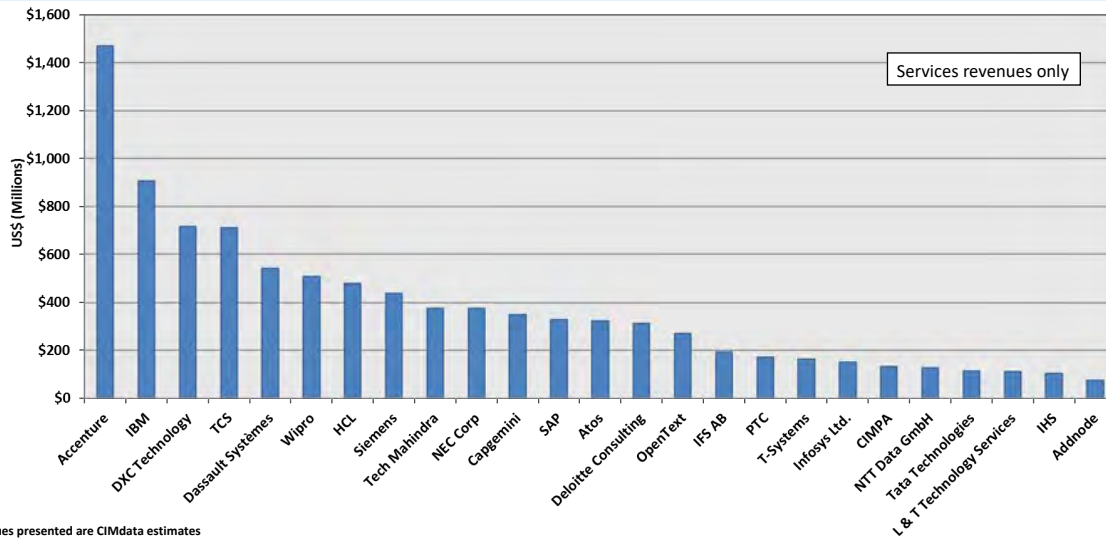
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2021 PLM Services Revenue Leaders

Changes in the services organizations of leading PLM solution providers



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Focused Application Providers

Expanding PLM through innovation

- Focused providers help expand the PLM market
 - Target specific market segments
 - Create solutions that complement major providers' suites
 - Introduce new technology and working paradigms into the PLM environments
- Many create technologies and solutions that are acquired or embedded into the comprehensive providers' product suites
- Frequently become acquisition targets
 - E.g., Dassault Systèmes and Medidata, Honeywell and Sparta Systems
- Harder (or impossible) to continue to measure separately post-acquisition

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cPDM Provider Analysis

Review of cPDM provider revenue performance

- cPDM sector had better than expected results
- Comprehensive segment dominated by “mindshare” leaders
 - Aras, Dassault Systèmes, Oracle, PTC, SAP, and Siemens PLM Software
- Other major providers
 - Autodesk, IBM, IFS, and Infor
 - NEC focused on Japan
- New providers continue to emerge
 - Continuing the expansion
 - Cloud-native (CassiniPLM, Ganister, JWI, OpenBOM, Upchain, etc.), some on cloud platforms (Propel PLM)
 - Local providers, i.e., China, Russia, etc.

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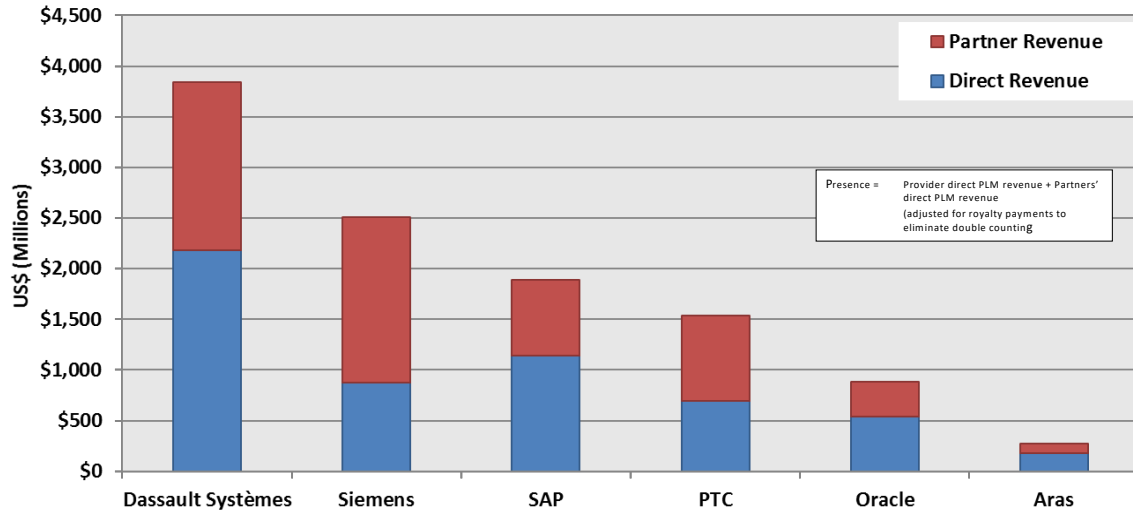
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2021 cPDM Leaders Market Presence

Shows impact on cPDM market sector



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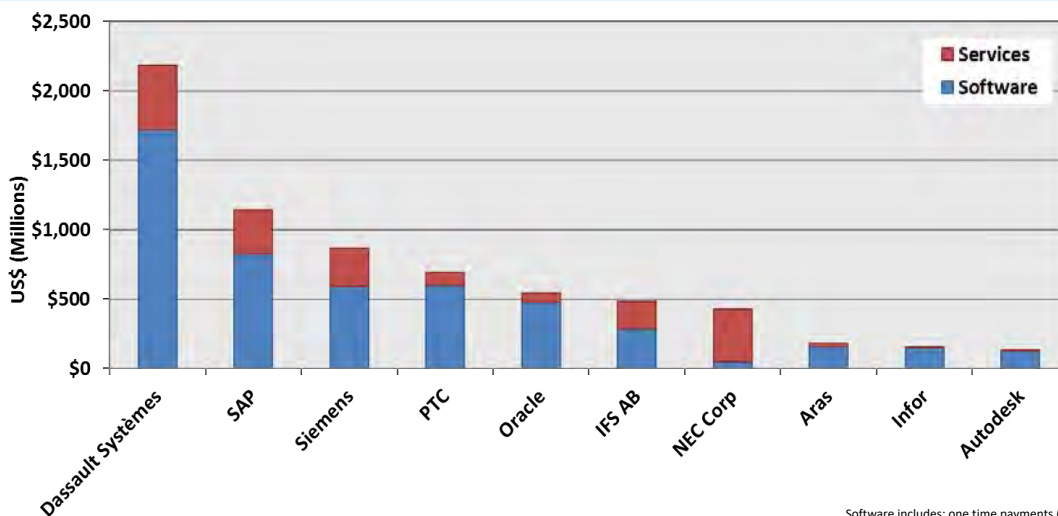


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2021 cPDM Leaders Direct Revenue

Software provides the majority of revenue for most providers



Revenues presented are CIMdata estimates



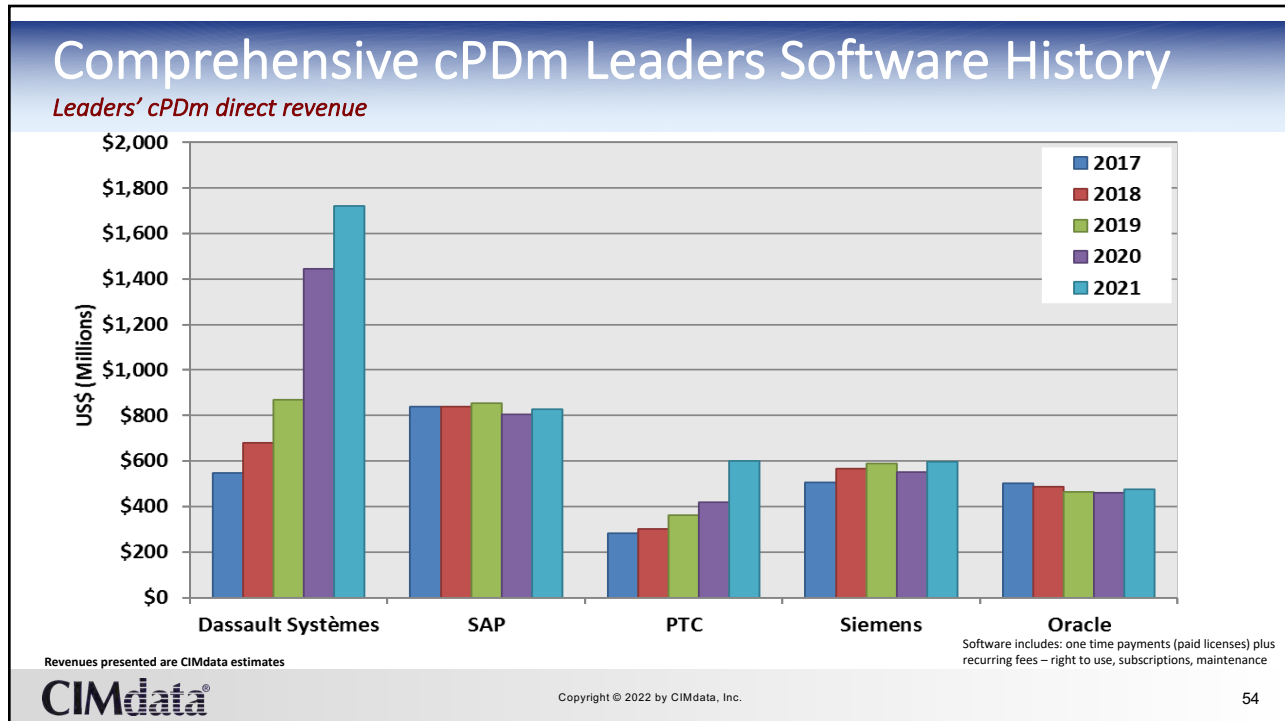
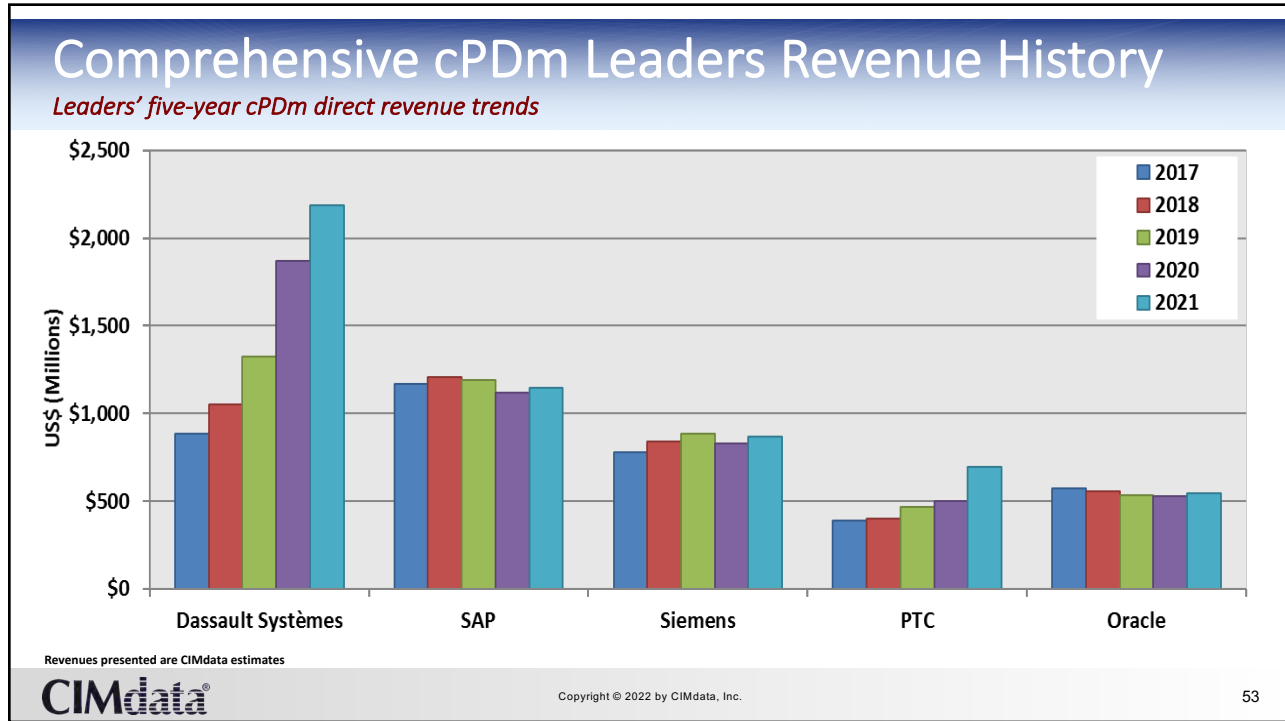
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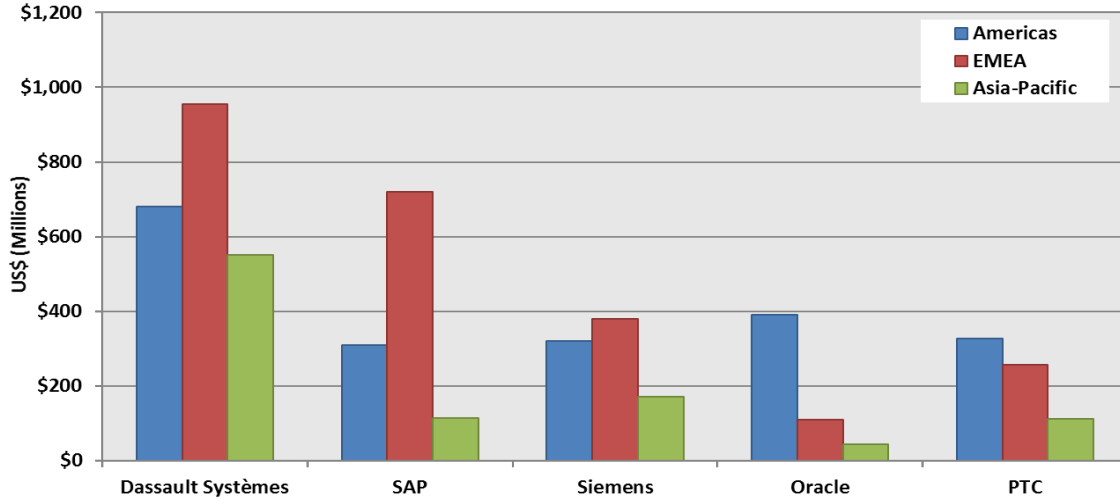


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2021 Comprehensive cPDM Providers

Leaders have different regional direct revenues



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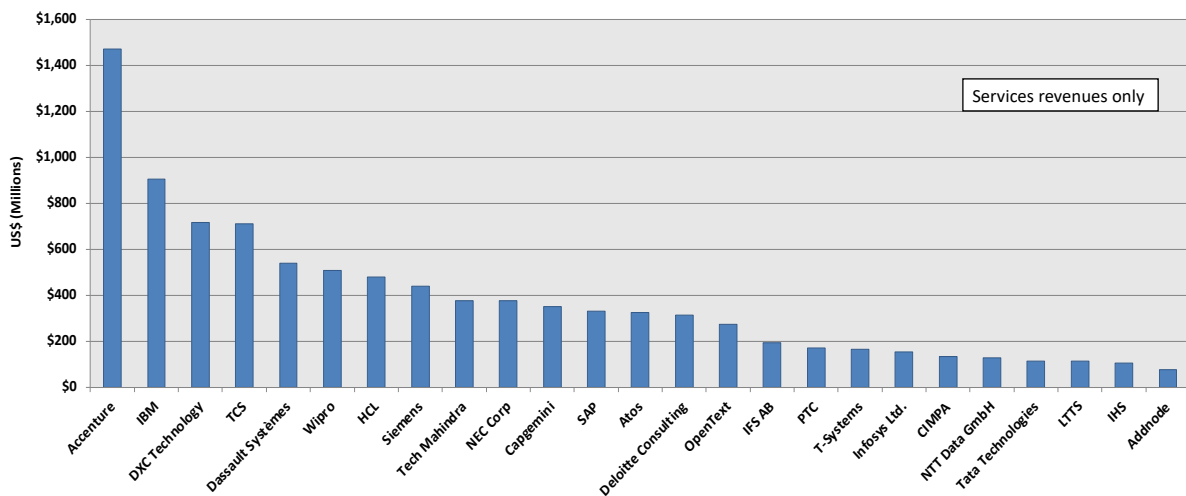


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2021 cPDM Overall Services Leaders

Comprehensive providers have growing services organizations



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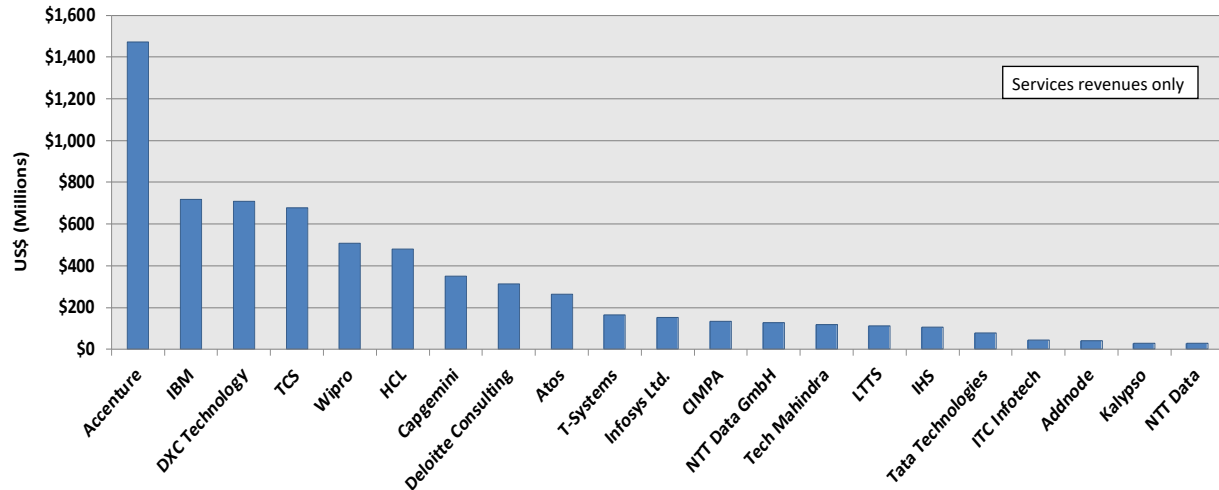
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2021 cPDM Independent Services Leaders

cPDM independent services continue to grow



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Overall cPDM Providers

Continuing evolution among the overall leaders

- Leaders are from all cPDM segments
 - These providers do not always compete
 - Some partner on selected accounts
- Service providers continue to grow
 - Expect strong license growth in 2019 to lead to services growth in out years (eventually)
- Fifteen cPDM solution and service providers larger than \$400M in 2021, up one from 2020



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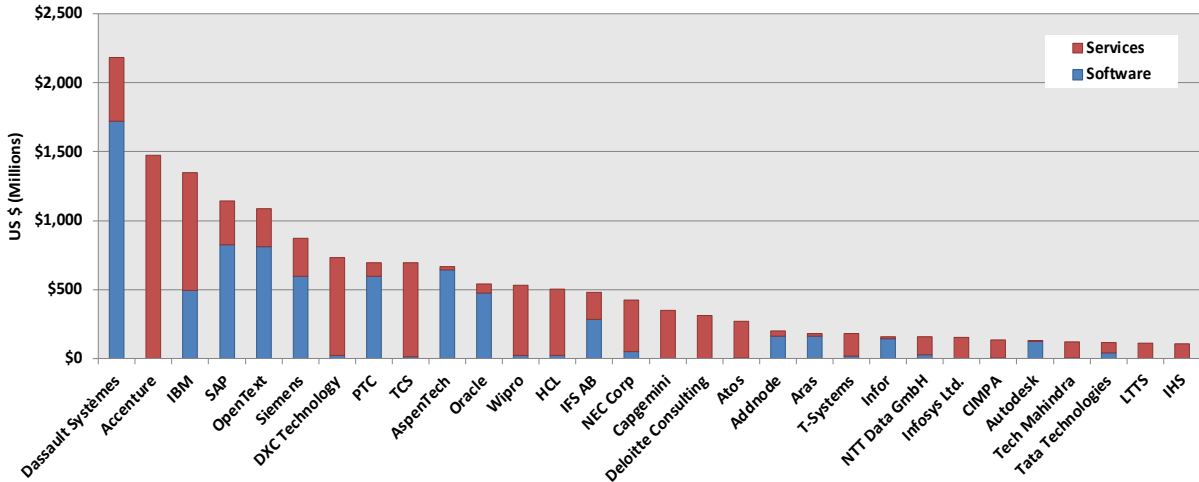
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Overall 2021 cPDm Revenue Leaders

Services are a major factor in overall revenue



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Comments on Tool Segments

Will be some impact from conflict in Ukraine

Segment	Comments
MCAD-MD	Expect continued slow growth in this segment as auto and A&D stagnate; most opportunity in countries investing in those industries
MCAD-DF	DF segment often affected by recession; results buoyed by Autodesk and PTC move to subscription; SOLIDWORKS a consistent performer
CAM	Always hit by recession, still recovering
S&A	Significant M&A activity in market leaders, trends driving growth will remain strong (smart connected product/Industry 4.0, need for more simulation on the left side of the Vee)
EDA	Strong year, even stronger for others besides the leaders; same trends as S&A
AEC	Key to (re)defining the built world, expanding interest in discrete PLM issues; oil & gas affected by energy prices, economic turmoil
Other Tools	Again, smart connected products driving investments; e.g., Atlassian up 30% again in last fiscal year



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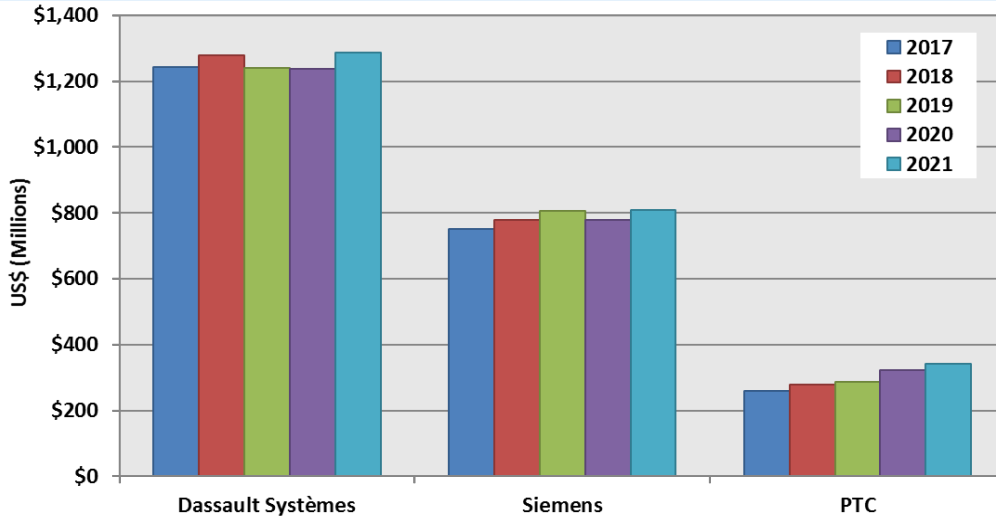
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MCAD Multi-Discipline

Leaders revenue histories



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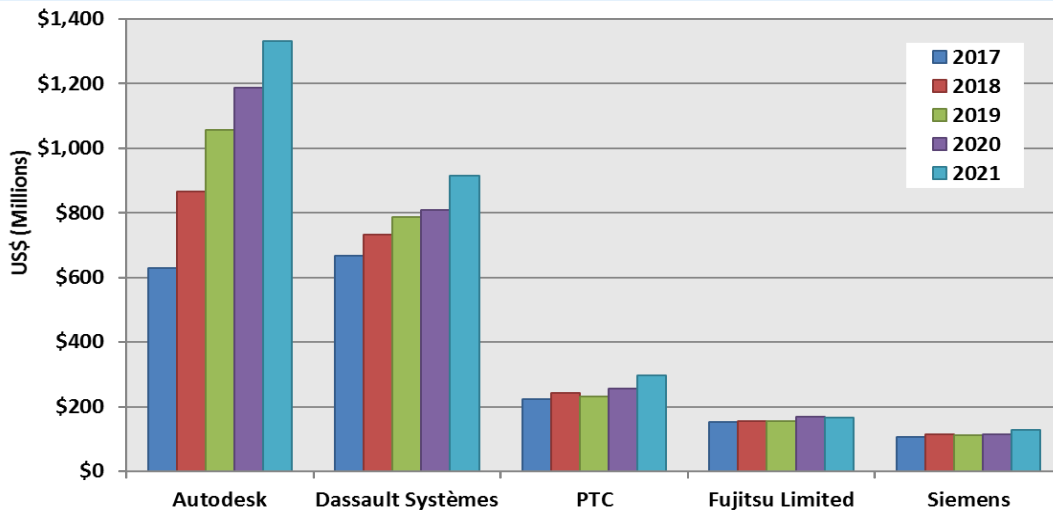


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MCAD Design-Focused

Leaders revenue histories



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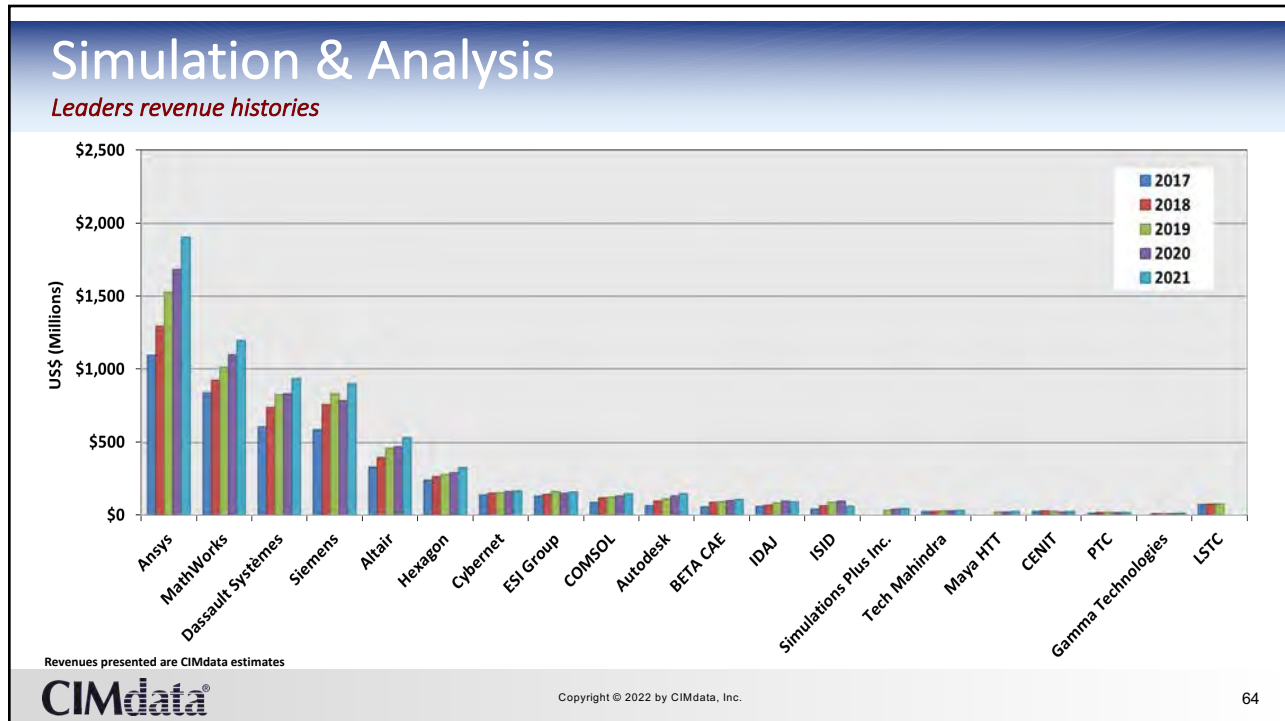
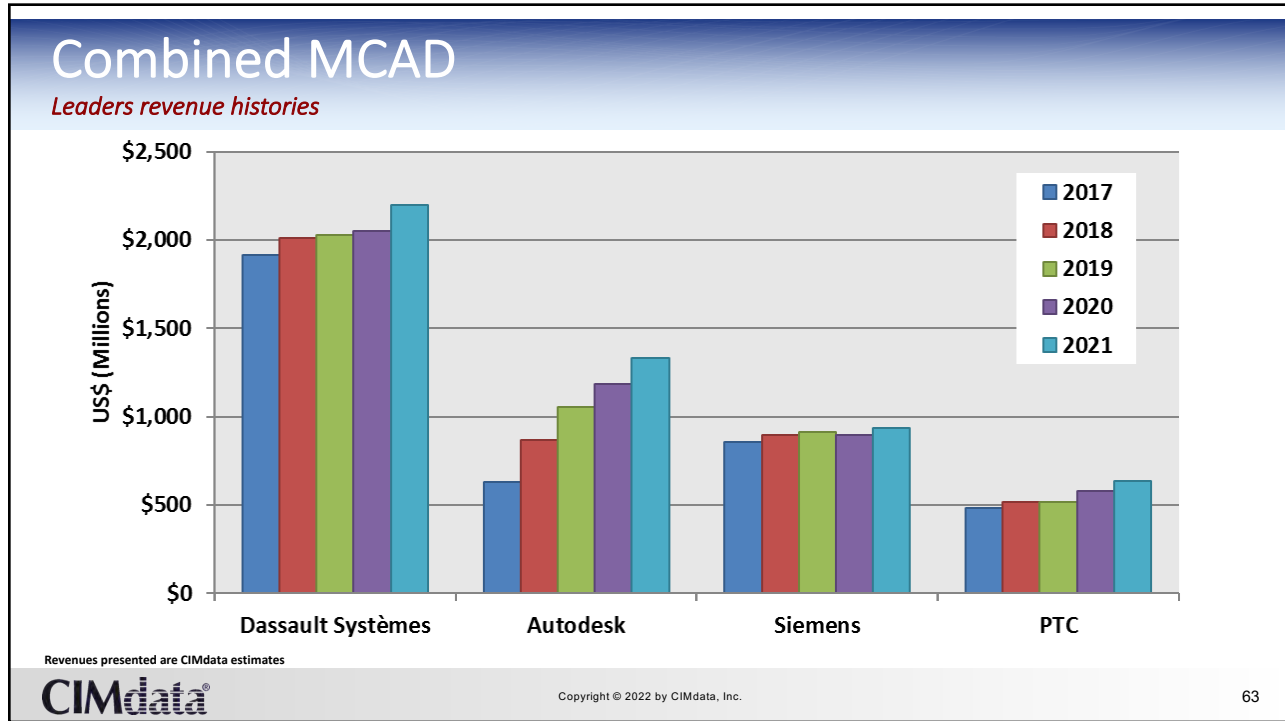


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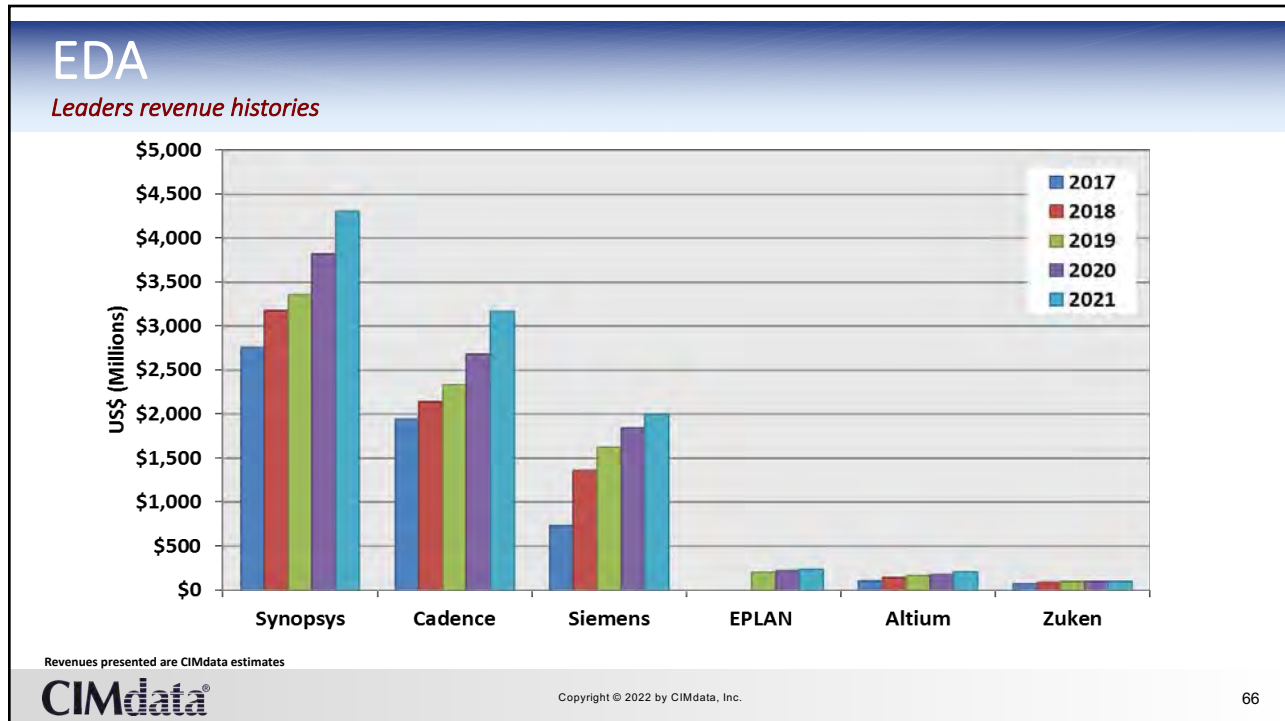
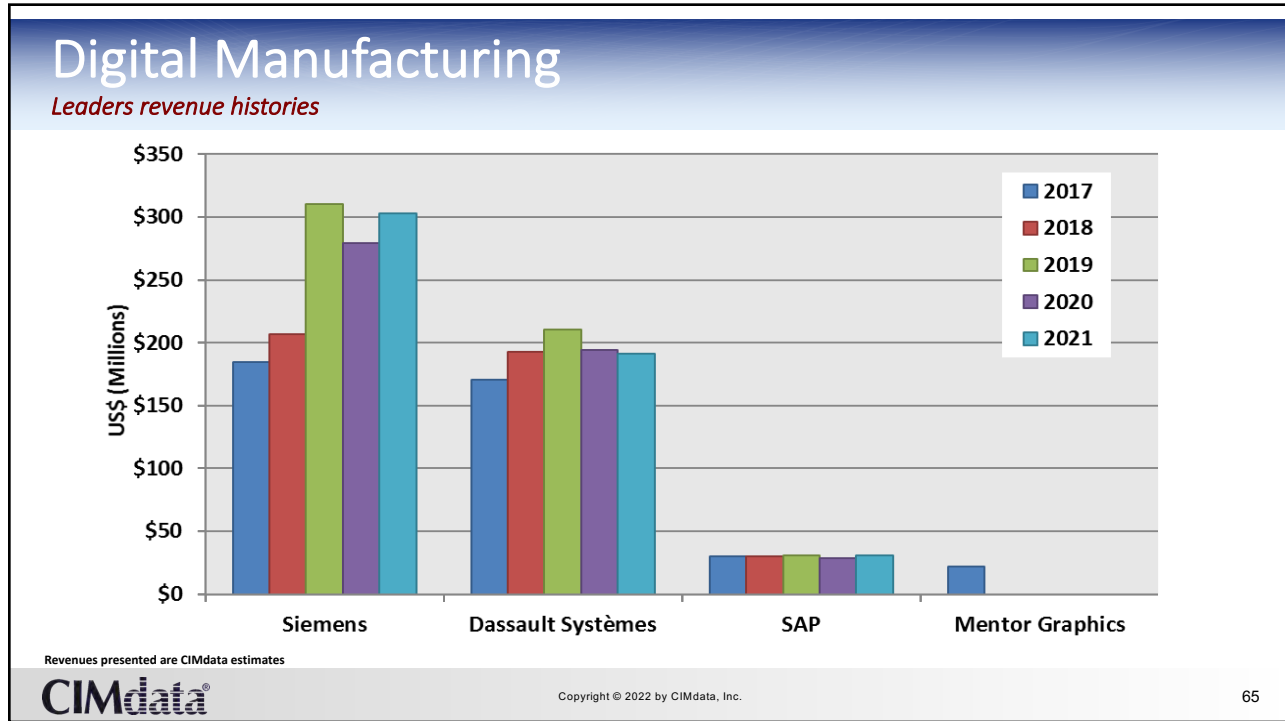
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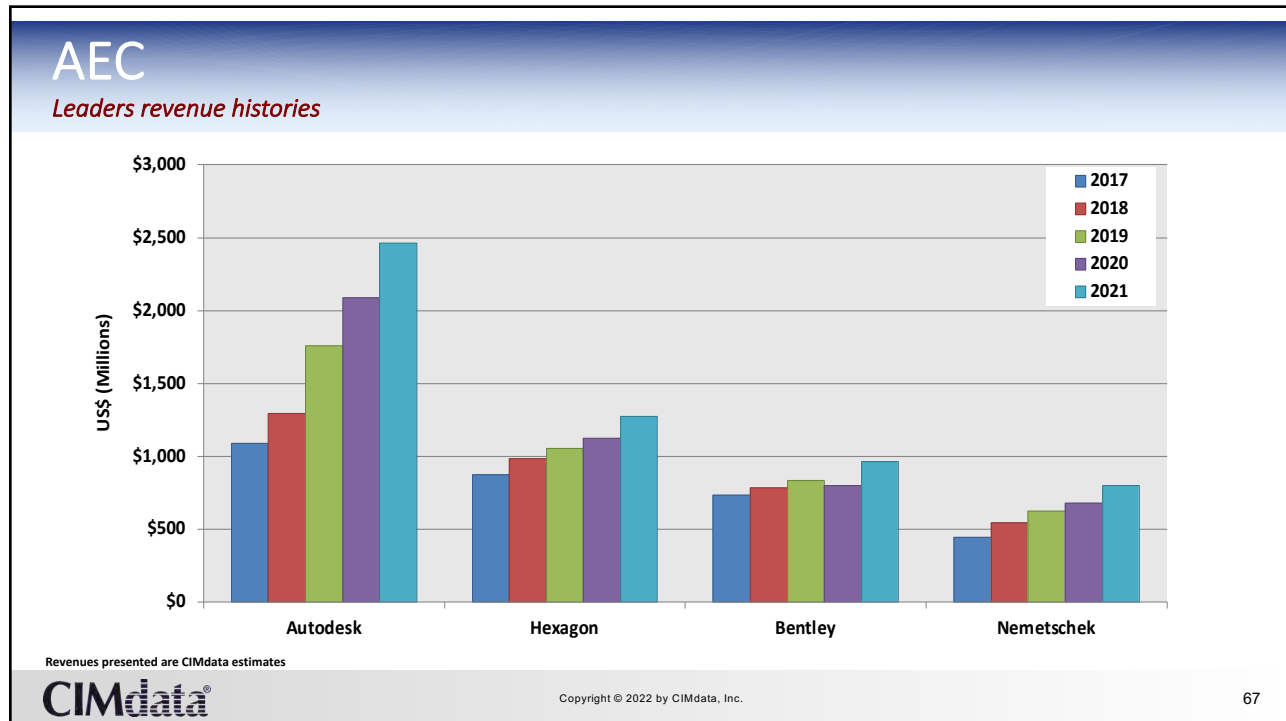
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Agenda

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- PLM Market Analysis
- Overall cPDM Market Analysis
- PLM Provider Analysis
- Provider Sector Analysis
- Concluding Remarks

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Concluding Remarks

Factors impacting the PLM Economy

- Higher than forecast, too pessimistic in the EDA and S&A segments
- Recovery from COVID-19 impacts for the most part
- Subscription can back stop declines, assuming no defections
- Simulation and systems engineering still key
- Mergers and acquisitions will continue to play a role
 - Providers look to fill out their portfolios
 - An important part of the platformization trend
 - A lot of activity in the SI/Reseller/VAR space
- Cloud interest and action increasing, at a tipping point?
- PLM refresh programs will continue, as suggested in recent CIMdata research



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The CIMdata PLM Market Analysis Report Series

Major PLM Foresight deliverables, a growing Market Analysis Report (MAR) series (1 of 2)



- CIMdata Executive PLM Market Report
- CIMdata PLM Industry Review and Trends Report
- CIMdata PLM Market and Solution Provider Analysis Report
- CIMdata PLM Market Geographic Analysis Report
- CIMdata PLM Market Industry Analysis Report



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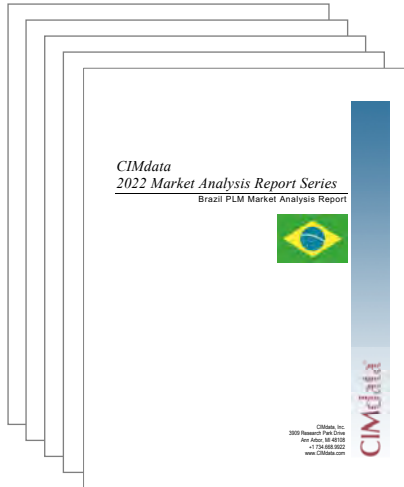


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- CIMdata China PLM MAR
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The CIMdata CAM Market Analysis Report

30th annual report published in 2021—part of CIMdata's Computer Integrated Manufacturing (CIM) heritage



- CIMdata's long-running report on the Computer-Aided Manufacturing (CAM) market
- Part of CIMdata's CAM Service
- Report provides detailed statistics on SW spend, seat counts, app areas, etc.
- Delivered in two "drops"
 - Advance Packet – tables & charts contained in the report
 - CAM MAR – full report with market updates, commentary, etc.

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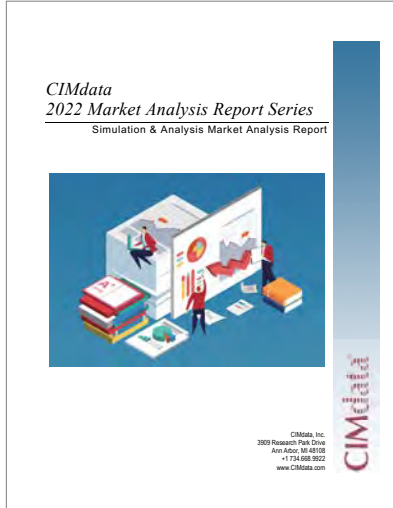
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The CIMdata S&A Market Analysis Report

More fully leverages PLM MAR data, adds S&A specific content



- Expanded coverage of S&A market
- MAR contains S&A market data
 - Company size
 - Software and service delivery
 - By industry
 - By geography / country
- Includes qualitative section on Top 10 S&A solution providers
- Also includes end user research based on Collaborative Research program

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