

Smart Innovators: Asset Investment Planning Software

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Smart Innovators: Asset Investment Planning Software

Understanding how to leverage technology to better manage asset investment is a challenge that has become increasingly important, due to ongoing COVID-19 restrictions, bullish net zero emissions targets and aggressive sustainable development goals. To help customers navigate the current volatility in the market, Verdantix has evaluated the capabilities of 17 asset investment planning (AIP) solutions providers. With ongoing questions of how to identify an appropriate area of spending becoming increasingly complex, and trade-offs being made between maintaining, upgrading and closing operational infrastructure, C-suite executives (CxOs) and operations managers should consider the solutions discussed in this report to support long-term capital expenditure (CAPEX) decision-making.

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ORGANIZATIONS MENTIONED

1898 & Co., ABB, AECOM, Arcadis Gen, AspenTech, Asstetic, Atkins, Australian Energy Regulator, BP, BPD Zenith, Brightly Software, Burns & McDonnell, CIGRE, City of Montreal, Cityworks, Copperleaf, Cosmo Tech, Deighton, DIREXYON, EAMS Group, EA Technology, Endeavour Energy, Endevor, Facility Health, Golder, Gurobi, Hatch, Hexagon, IBM, Icon Water, ICS Consulting, **Infrastructure Solutions**, International Organization for Standardization (ISO), Microsoft, National Grid, Ofgem, Oracle, Ovarro, PowerPlan, Pragma, Probit Consulting, Rosneft, SAP, Siemens, SimulAi, Tableau, The AnyLogic Company, Ultimo, US Environmental Protection Agency (EPA), US Securities and Exchange Commission (SEC), West Sussex County Council, WSP

Smart Innovators: Asset Investment Planning Software

Understanding how to leverage technology to better manage asset investment is a challenge that has become increasingly important, due to ongoing COVID-19 restrictions, bullish net zero emissions targets and aggressive sustainable development goals. To help customers navigate the current volatility in the market, Verdantix has evaluated the capabilities of 17 asset investment planning (AIP) solutions providers. With ongoing questions of how to identify an appropriate area of spending becoming increasingly complex, and trade-offs being made between maintaining, upgrading and closing operational infrastructure, C-suite executives (CxOs) and operations managers should consider the solutions discussed in this report to support long-term capital expenditure (CAPEX) decision-making.

Industrial Firms' Capital Investment Planning Is Increasingly Challenged By A Range Of Industry Trends

Ongoing global environmental and political constraints are causing asset-intensive organizations to question how to leverage technology to better manage their asset portfolios, realise new efficiencies and minimize wastage. Adoption of standalone AIP software applications has largely been driven by:

- **Ageing assets and network infrastructure demanding increased capital expenditure.**
Global infrastructure across asset-intensive industries is rapidly ageing, increasing the risk of failure and impeding growth opportunities. The majority of the transmission and distribution (T&D) lines in the US were constructed in the 1950s and 1960s with a 50-year life expectancy. As a result, executives in these industries must make tough decisions about where, when and how much to invest. The 2021 Verdantix global operational excellence survey showed that nearly 90% of the 256 executives interviewed believe that replacing ageing and inefficient industrial equipment is a 'very significant' ESG and sustainability trend affecting their firm's operational excellence strategy over the next 12 months (see [Verdantix Global Corporate Survey 2021: Operational Excellence Budgets, Priorities & Tech Preferences](#)). AIP software allows users to evaluate and optimize the capital expenditure of replacement and refurbishment programmes by modelling and predicting asset life cycles, while reducing risk and optimizing business objectives.
- **Stringent regulations requiring organizations to invest in projects to stay compliant.**
The International Organization for Standardization (ISO) 55000 series of international standards for asset management, along with the recently proposed rule changes by the US Securities and Exchange Commission (SEC), would require registrants to include information about climate-related risks in their statements and periodic reports. These are causing firms to reevaluate processes, with the intent of maximizing asset value while balancing risk, cost and performance. AIP software can operationalize standards and regulations to enable organizations to bring together financial and non-financial elements, supporting data-driven investment decisions and providing an auditable track of actions.
- **Uncertain future investment strategies.**
With ongoing geopolitical unrest, the aftermath of COVID-19 and a global environmental crisis, firms are experiencing considerable impact on their day-to-day operations and seeing their long-term strategies thrown into disarray. Witness BP, which over the last 30 years has steadily increased operations in Russia by partnering with Rosneft to produce around half of its oil and gas reserves. Following Moscow's invasion of Ukraine, BP has abandoned its stake in Rosneft, subjecting itself to charges of up to \$25 billion and major implications to its future investment plans. Despite these unpredictable disasters, industrial firms need to ensure that strategic objectives are met. Firms are turning to AIP software that can simulate

multiple scenarios using statistical methods to identify investment strategies with the lowest cost and risk.

- **Need to achieve sustainability and other non-financial objectives.**

The growing momentum around the transition to low/net zero carbon and other ESG factors is creating new requirements for sustainable operations and driving the need to quantify non-financial benefits. As a result, decisions to invest, maintain or replace must assess social and environmental benefits on the same level as economic gains (see [Verdantix Market Overview: Investor Focus On ESG Will Transform Sustainability Strategies](#)). AIP software allows users to integrate a range of sustainability and non-financial valuations – such as environmental impact or the effect of GHG emissions on asset interventions – in all stages of the investment process, by attributing quantifiable factors to the decision-making framework. By doing so, firms can optimize capital plans to achieve net zero goals as quickly and cost-effectively as possible.

- **Limitations of Excel for multiple scenarios modelling.**

Historically, organizations have invested in Microsoft Excel to support CAPEX and operational expenditure (OPEX) decision-making processes. As assets become progressively more complex, and with increased demand to incorporate soft metrics into the decision-making process, the usability and effectiveness of Excel dramatically declines. Firms can no longer rely on outdated methods that are not designed to deal with complex technical assets, soft benefits and asset dependencies. AIP software combines predictive models, asset condition and performance data, and financial analysis to provide investment advice for stakeholder and operational representatives.

- **Functionality gaps in existing EAM, project and portfolio management solutions for long-term decision-making.**

Asset-intensive industries have adopted enterprise asset management (EAM) software and, to a lesser extent, asset performance management (APM) software in the past decades to support asset reliability and maintenance. Of the 256 executives interviewed in the 2021 Verdantix global corporate survey, 71% stated that they were using EAM software to support asset reliability and integrity management. However, a data-driven method to establish strategic multi-decade investment planning is still lacking. Firms are turning to AIP software to fill the functionality gap by performing asset modelling of investment and maintenance scenarios (see **Figure 1**).

- **Rising digitization of asset maintenance practices.**

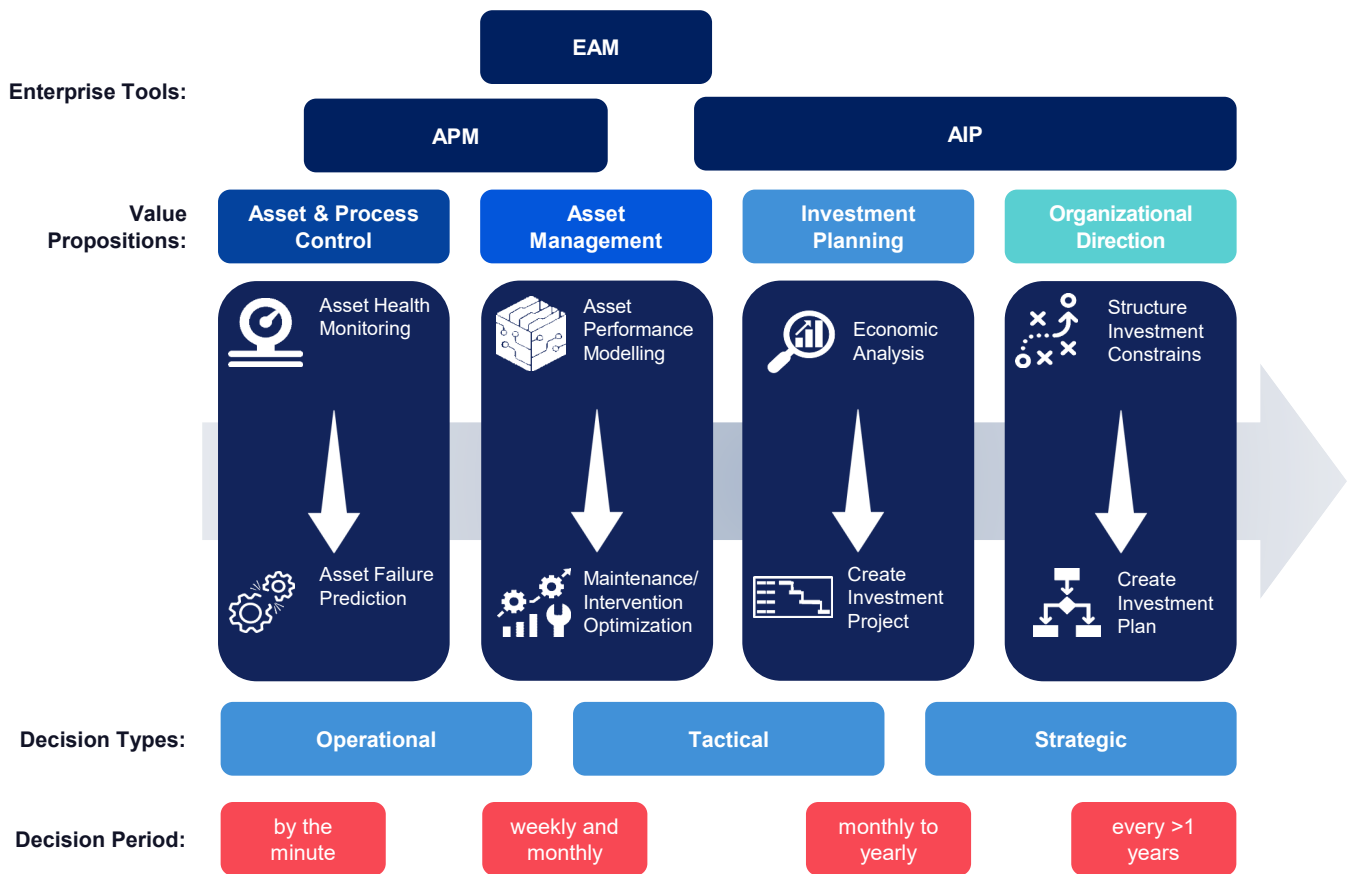
While a firm's digital maturity levels do not affect its readiness to implement an AIP solution, our research shows that the more digitally mature firms (those that have implemented EAM or predictive maintenance software) are the ones leading the adoption of AIP software (see [Verdantix Organization Size Dictates Digital Maturity Level For Industrial Asset Management](#)). These firms are looking to push the boundaries of digital innovation and capitalize on technology to drive productivity and efficiency, as well as to capture strategic business value.

Introducing The AIP Software Market

The AIP software market is forecast to grow from \$265 million in 2021 to \$486 million in 2026, at a CAGR of 10% (see [Verdantix Market Size and Forecast: Industrial Asset Management Software 2021-2026 \(Global\)](#)). Asset-intensive organizations are turning to AIP solutions to support long-term CAPEX decision-making. Verdantix defines AIP software as a:

FIGURE 1

The Industrial Asset Management Landscape



Source: Verdantix analysis

"Data-driven approach to assess and prioritize capital investment strategies over a medium- to long-term period (typically more than a year), allowing organizations to manage assets, meet business-level objectives, reduce the risk of asset failure and minimize the need for wide variations in capital spending."

To gain an in-depth understanding of the AIP market, Verdantix evaluated 17 AIP solutions providers. The following 15 vendors provided briefings: 1898 & Co., AnyLogic, Arcadis Gen, Brightly Software (formerly known as Dude Solutions), Copperleaf, Cosmo Tech, DIREXYON, EA Technology, Endeavor, Hexagon, **Infrastructure Solutions**, Ovarro, Pragma, Probit Consulting and Ultimo. Vendors who were contacted but did not respond or missed deadlines were Deighton and PowerPlan.

AIP Software Enhances Complex Longer-Term Tactical And Strategic Decisions

With a well-defined operational improvement roadmap and a clear vision in mind, firms can select the right-fit AIP software. The resulting AIP software implementation can realize significant benefits, such as:

- **Increased insights into investment prioritization through informed data-driven planning.**
Long-term investment decisions and prioritizations have always been limited by uncertain futures. However, with AIP software, firms can run thousands of scenarios to optimally balance costs, risks and performance improvements of competing asset intervention decisions. Such information will allow firms to make data-driven decisions when looking at the trade-offs between maintenance and replacement, ultimately providing stakeholders with answers to fundamental questions such as: How big a budget do I need? What should I spend it on? When should I spend it? By implementing the DIREXYON AIP suite, for example, the City of Montreal has reported reductions of over 30% in annual investment since 2013.
- **Reduction in risk through targeted investment, centralized data and scenario-modelling.**
Risk management has become an integral part of good asset management practices. AIP solutions provide a holistic overview of all assets, to support firms in clearly ranking the consequences of asset failure by acceptable risk levels and to show the multiple risk mitigation investments that can be made with current resources. The solutions can also account for black swan events. With a history of pipe collapses, blockages and overflows, Icon Water, an Australian water and wastewater public utility, found that its sewer network was not performing to standards. To overcome this, the firm selected Arcadis Gen's enterprise decision analytics (EDA) solution to develop a new approach to maintenance and investment planning, with smart, data-driven decision-making. By implementing EDA, Icon Water obtained a clear understanding of the cost, risk and performance of its entire sewer network. This resulted in greater efficiency in terms of the creation of investment plans and collaboration between stakeholders, allowing the firm to identify ways in which risk versus performance could be balanced with a reduced budget.
- **Transparent, justifiable and auditable approach to multi-decade decision-making.**
Stakeholders are always looking for justification between maintaining existing infrastructure to increase its remaining useful life or undertaking new capital investments. AIP software can manage assets across the entire life cycle – from construction, through operation and maintenance, to decommissioning and replacement – by performing strategic, long-term asset, risk and budget management. By having a complete lifecycle analysis and auditable trail, users of AIP software can easily demonstrate the benefits of investment plans and facilitate regulatory compliance with industry standards such as ISO 55000. Owing to capital budget constraints, Energex, an Australia-based electrical utility, engaged the services of EA Technology to investigate investment options that reduced asset-related risk, improved network performance and maximized investment benefits, while being fully auditable within regulatory submissions. Through the deployment of EA Technology's Invest platform, Energex was able to improve asset management by reducing replacement activities by 20% and create a fully auditable capital investment plan that an independent consulting firm recommended be accepted in full by the Australian Energy Regulator. PowerPlan, meanwhile, enables firms to sync their asset investment plans with requirements for grant programmes and with asset management standards such as ISO 55000, MAP-21 legislation and US Environmental Protection Agency (EPA) Consent Decrees. Cosmo Tech has partnered with Ofgem, the energy regulator for Great Britain, to enable firms to ensure compliance with the Common Network Asset Indices Methodology (CNAIM) for evaluating electrical grid risk.

- **Enhanced incorporation of environmental factors in decision-making.**

Following the significant global climate action goals set out in COP26, and ongoing pressures to support ESG initiatives, firms need to go beyond using purely financial information to drive investments. AIP software can quantify environmental concerns, sustainability factors, the health and wellbeing of employees, risks to local communities and more. As a result, senior executives can model various scenarios, focusing on factors such as site location, emissions or risk, to gain a view of impacts across a range of concerns. Multinational utility National Grid is incorporating sustainability metrics into its decision framework by utilizing the Copperleaf decision analytics suite of solutions. Through this technology, National Grid is able to prioritize and justify the value of projects that minimize impact on the environment, while providing safe, reliable and affordable electricity.

The AIP Software Landscape Comprises Vendors From Three Different Backgrounds

AIP supports organizations in making long-term strategic decisions. By understanding asset conditions, risks and strategies, organizations can use AIP solutions to support long-term asset investment plans, sustainability goals and international accreditation (see [Verdantix Strategic Focus: High Value Use Cases And Benefits Of Asset Investment Planning Software](#)). However, depending on industry, users require varying levels of customization and sophistication (see **Figure 2**). These varying industry requirements have led to the evolution of vendors from different backgrounds, consisting of:

- **EAM software vendors offering AIP functionality.**

EAM and APM vendors provide solutions to support decision-making across the asset life cycle – from design to operations – encompassing maintenance, safety, risk, environmental considerations and other business needs. With the ability to better manage, predict and optimize assets, operations can influence capital decisions. To support such activities, asset management vendors such as ABB, AspenTech and Hexagon have expanded their offerings, utilizing asset-centric data to support long-term investment planning. These vendors use their deep understanding of asset condition and failure modes to provide AIP software with high levels of confidence and granularity, to support short- and medium-term investment horizons (of one to ten years). Hexagon’s HxGN EAM (formerly Infor EAM) solution offers a fully integrated EAM platform with an embedded AIP application, which can be used to determine the best investment plan according to a firm’s objectives and constraints.

- **AIP software specialists.**

Providers such as Copperleaf, Deighton and DIREXYON offer standalone AIP software. These providers focus on combining financial information and analytics with high-level asset data to enable multi-decade decision-making, allowing firms to maximize the value of their investment portfolios. The providers typically concentrate on investment strategies for medium- and long-term horizons (5, 20 and 50+ years). Specialists have developed solutions tailored to industry-specific challenges. Copperleaf, for example, was founded to support energy utility providers; DIREXYON and **Infrastructure Solutions** were created to support municipalities; and Endeavor has roots in supporting the nuclear industry.

- **Consulting services providers with an AIP software offering.**

Firms across asset-intensive industries have been gathering ever-increasing amounts of data to support asset management and investment decisions. They are now looking to utilize advanced data analytic tools to analyse the captured data. Firms such as Hatch and SimulAi provide assistance with asset modelling and decision-making processes, encompassing training, data collection and mapping, technical consultancy, product development and system deployment. ICS consulting has developed an AIP offering that utilizes the flexibility of Tableau to deliver an interactive solution custom-built to meet user needs.

FIGURE 2

Industry Coverage for Asset Investment Planning Software Providers

Company	Software Name	Oil and Gas	Chemical	Manufacturing	Transport	Power Utility	Water Utility and WasteWater	Mining	Nuclear	Public Sector
Infrastructure Solutions	DOT				✓		✓			✓
AnyLogic	AnyLogic			✓			✓			
Arcadis Gen	EDA				✓	✓	✓			
Brightly Software	Predictor				✓	✓	✓			✓
Copperleaf	Copperleaf Asset/Portfolio/Value	✓			✓	✓	✓		✓	✓
Cosmo Tech	Cosmo Tech Asset			✓		✓			✓	
Deighton	dTIMS				✓		✓			
DIREXYON	DIREXYON AIP Suite				✓	✓	✓			✓
EA Technology	Invest					✓				
Endevor	ENGAGE								✓	
1898 & Co.	AssetLens			✓		✓				
Ovarro	PIONEER						✓			
PowerPlan	Asset Investment Optimization Suite	✓				✓	✓			
Probit Consulting	AIM				✓	✓	✓			

Note: Industry coverage based on publicly available case studies

Source: Verdantix analysis

AIP Software Has Eight Core Capabilities

As the asset management market evolves, the functionality of AIP, APM and EAM starts to overlap – and so too do the vendor offerings. Traditional APM and EAM vendors have embedded AIP functionality into their offerings, while AIP software specialists have created off-the-shelf integrations with maintenance technologies to bridge functionality gaps. Regardless of origin, AIP solutions need specific product features to support long-term asset investment plans, sustainability drivers and international accreditation. Furthermore, users of AIP software will prioritize different capabilities. To meet customer requirements, vendors need to offer a range of analytics with varying levels of customization and sophistication. For the purposes of this study, Verdantix has only assessed functionality offered by vendors with standalone AIP solutions. As a result, firms such as AspenTech, Hexagon, IBM, Oracle, Pragma and Ultimo, which offer AIP functionality within their APM or EAM offerings, have not been evaluated. Verdantix recommends that potential buyers assess vendors based on their ability to offer (see **Figure 3** and **Figure 4**):

- **Data storage and easy input of strategic data.**

Potential users of AIP software will have data in various systems that need to be input and stored within the AIP architecture. AIP software must be able to consider and store the strategic inputs that will constrain an investment plan. Such inputs tend to include operational data and data based on the strategic vision of a firm, such as budgetary limits, legislative information and sustainability metrics. Vendors have developed off-the-shelf and custom models that can automate the data input processes. The majority of vendors have the flexibility to input any data that can be quantified; however, the amount of data that can be used within models may vary. Copperleaf's AIP software provides over 250 out-of-the-box value models, which incorporate a variety of KPIs for financial performance, reliable service, safety, environmental stewardship and social responsibility. Arcadis Gen's AIP software uses machine learning (ML) to enhance the quality of data by filling gaps where data is missing.
- **Connection and integration with external data sources and software applications.**

In the Verdantix 2021 global corporate survey, almost 70% of respondents marked open architecture for integration as 'very important' or 'important' when evaluating software applications for industrial asset management – the highest of 12 options (see [Verdantix Global Corporate Survey 2021: Operational Excellence Budgets, Priorities & Tech Preferences](#)). The majority of AIP solutions offered by providers have the capability to automatically integrate with, detect and import asset information from relevant data sources, such as APM, EAM, geographic information systems (GIS), financial and other systems. Cosmo Tech has integrated its solution with Microsoft Azure, creating a platform-as-a-service that can easily register asset-level data originating from any APM, EAM, enterprise resource planning (ERP), project portfolio management (PPM) or asset register database. PowerPlan has created standard two-way integrations allowing for real-time data exchange from ERP solutions such as SAP's S/4HANA, along with in-built GIS integrations and partnerships with Maximo resellers such as BPD Zenith, to support EAM integrations.
- **Existing technology infrastructure and the time horizon of investment plans.**

AIP, APM and EAM software applications are heavily interlinked, with overlapping functionality and vendors offering varying capabilities. Firms looking to create asset investment plans dependent on operational data with strong EAM links over a time horizon of one to ten years should utilize solutions from vendors with strong asset performance modelling capabilities, such as AspenTech, Hexagon and Ultimo. The Hexagon software (HxGN EAM), bridges the gap between financial portfolio management and physical plant management to provide the most economically feasible maintenance plan. Its solution supports long-term planning over a one- to five-year horizon, with strong functionality for asset performance modelling. Firms looking to create asset investment plans that focus on asset end of life

over a 20+ year horizon should utilize solutions from vendors with strong portfolio and asset lifecycle management modelling capabilities, such as Brightly Software, DIREXYON and Probit Consulting. Firms seeking strong operational consideration and asset lifecycle management should review firms such as 1898 & Co., Arcadis Gen, Copperleaf and [Infrastructure Solutions](#).

- **Financial analytical tools.**

Another core capability of an AIP solution is its ability to quantify the level of investment required for each intervention option. The more detailed the economic analysis of the software, the more sophisticated and reliable an investment plan will be. Brightly Software's AIP solution, Predictor, contains a number of libraries that customers can use to support economic calculations. Users can easily obtain answers to the most important capital planning questions, such as how to establish target performance and attain strategic objectives within CAPEX limits, or about the impact on asset performance of delaying or accelerating a capital project. Users can also constrain potential investment decisions based on funding originations, material and condition, allowing them to understand the impact of investments on asset life cycles. With 13 out-of-the-box degradation profiles, and partnerships with AECOM, Atkins and Cityworks, users of Predictor can easily understand the financial impact of interventions on different assets.

- **Long-term investment planning models for asset lifecycle strategy.**

A key capability of AIP software is to create models of varying fidelity to ensure the development of optimal long-term investment plans. Such plans are needed to identify investment across an entire asset, accounting for individual asset needs, environmental governance and strategic vision. These modelling approaches tend to take a top-down approach, utilizing remaining useful life data on assets, and degradation models, to create intervention (repair or replace) scenarios. Investment plan models typically start at the 10+ year mark and can be drawn up for 40 to 50 years, or for longer timescales. Long-term models require 'what-if' functionality that can simulate various scenarios to enable the selection of the investment strategies that are most in line with the strategic objectives as well as the vision of a firm. Probit Consulting, a UK-based data analytics provider, utilizes the Gurobi mathematical solver to run global optimizations, analysing a large number of assets quickly to formulate highly sophisticated and optimized investment decisions. By using Copperleaf's AIP product suite and value framework, Endeavour Energy, an Australia-based power T&D organization, has been able to align its investment portfolio with both its immediate business plan and its long-term corporate strategy, resulting in budget efficiency improvements in the range of 5% to 10% (see [Verdantix Case Study: Endeavour Energy Employs Copperleaf's Analytics To Architect A Sustainable Asset Investment Planning Framework](#)).

- **Asset performance modelling.**

An AIP solution will need to predict the current and future condition, as well as the performance, of assets, based on operational data, to draw up robust long-term investment plans. AIP software must take a bottom-up approach, utilizing asset performance data to predict failures and creating investment plans to avoid these failures accordingly. Furthermore, some vendors have the capability to establish intervention points and to evaluate corresponding maintenance strategies. An AIP solution will need to predict the performance of each asset, allowing organizations to plot decay curves and visualize deterioration over an asset's lifespan, to understand when asset failure will occur. Asset management software providers such as AspenTech and Hexagon use their maintenance experience to provide solutions with strong asset performance modelling capabilities. Arcadis Gen's AIP software integrates ML and GIS data with data from EAM software such as Maximo, to understand asset performance over time. Alternatively, some vendors have established partnerships to support asset performance modelling. Cosmo Tech, for instance, has partnered with CIGRE to provide reliability models for mean time to failure of electrical equipment.

FIGURE 3

Capabilities Criteria For AIP Software

Functionality	Definition
Data storage and easy input of strategic data	Ability to automatically input data into the system, utilize industry-specific, off-the-shelf models, fill missing data gaps and store strategic data.
Connection and integration with external data sources and software applications	Ability to integrate with, detect, import and export asset information from relevant data sources such as APM, EAM, ERP, GIS, etc.
Financial analytical tools	Ability to quantify the level of investment required for each intervention option (such as repair or replace) across the entire asset base.
Long-term investment planning for asset lifecycle strategy	Ability to create and compare long-term investment plans, taking into consideration the fidelity of optimizers, asset life cycle and scalability.
Asset performance modelling	Ability to predict current and future performance rates based on operational data. Models used to predict failure rates and deterioration models with a focus on asset performance data and scalability.
Configurable risk framework	Ability to quantify the risk of investment scenarios in relation to user acceptance levels, strategic visions and non-financial goals. Models are supported by mathematical equations and consider physical, environmental and socio-economic attributes.
Easily configurable reporting and visualization tools	Ability to create and customize a wide variety of reports based on user needs, including creating dashboards, presenting geospatial views and comparing multiple scenario analyses in a single view.
Bundling interrelated assets or projects for cost savings and efficiencies	Ability to create investment plans and projects that consider the interrelated relationships of assets (such as geolocation proximity, regulatory changes, climate change risks, etc).

Sources: Verdantix analysis, vendor interviews

- **Configurable risk frameworks.**

AIP software helps organizations quantify the risk of certain investment decisions and interventions in relation to their risk acceptability and tolerability limits. Vendors have taken up different methods to quantify risk, ranging from probability of likelihood vs consequence matrices to operationalizing the ISO standards for risk. A risk framework also needs to consider non-financial impacts, such as sustainability goals, carbon emissions thresholds and social implications. At the core of Probit Consulting’s AIM platform are risk maps that reveal and visualize the potential vulnerability of assets to failure and the impact this will have in financial terms, now and in the future. These risk maps show assets along with

FIGURE 4

Asset Investment Planning Software: Vendor Capabilities

Company	Strategic Inputs and Storage	Integrations	Financial Analysis	Long-term Investment Planning	Asset Performance Modelling	Reporting and Visualization	Risk Framework	Bundled Assets
Infrastructure Solutions	●	●	●	●	●	●	●	●
AnyLogic	●	●	●	●	●	●	●	●
Arcadis Gen	●	●	●	●	●	●	●	●
Brightly Software	●	●	●	●	●	●	●	●
Copperleaf	●	●	●	●	●	●	●	●
Cosmo Tech	●	●	●	●	●	●	●	●
Deighton	●	●	●	●	●	●	●	●
DIREXYON	●	●	●	●	●	●	●	●
EA Technology	●	●	●	●	●	●	●	●
Endevor	●	●	●	●	●	●	●	●
1898 & Co.	●	●	●	●	●	●	●	●
Ovarro	●	●	●	●	●	●	●	●
PowerPlan	●	●	●	●	●	●	●	●
Probit Consulting	●	●	●	●	●	●	●	●

Sources: Verdantix analysis, vendor interviews

their level of deterioration, service impact relationship, intervention costs and benefits. While working with West Sussex County Council, data from multiple sources, such as traffic speed surveys, visual inspections and skid-resistance tests, was input into a risk map, enabling the council to make investment decisions.

- **Easily configurable reporting and visualization tools.**

For buyers of software, the ability to quickly create custom dashboards and reports depending on user role, in order to understand the insights presented by the data, is a very important capability – and AIP software is no different. AIP software providers such as 1898 & Co., DIREXYON and **Infrastructure**

Solutions have enhanced their offerings to include geospatial visualization and uncertainty analysis, to deliver further usability and understanding. Firms such as Copperleaf and Ovarro utilize Power BI or Tableau (either via in-built integrations or through export functionality) to allow users to create customizable reports based on their needs.

- **Bundling of interrelated assets or projects for cost savings and efficiencies.**

While AIP software may be able to create capital plans with the highest financial and socio-economic return on investment, when these are applied, firms may see inefficiencies from an operational and workforce point of view. For example, action plans may send site engineers to two different assets at the same location within weeks of each other to perform maintenance activities, when it would be more operationally efficient to perform both activities at the same time. Some AIP software vendors have therefore added functionality to identify intervention opportunities that group neighbouring or interrelated assets into a single investment plan. Brightly Software, Copperleaf, DIREXYON and **Infrastructure Solutions** bundle assets together by considering geospatial proximity and the operational relationships of assets, to reduce the fragmentation of investment plans and minimize the mobilization of heavy equipment. After implementing the DIREXYON AIP suite, the City of Montreal was able to optimize work synchronization strategies and consider the effects of individual interventions on co-existing assets within the same segment.

AIP Software Market Presents Strong Opportunities For Vendors And Customers

The AIP software market has been building good momentum over the last two years. With executives at asset-heavy and process-intensive industries increasingly pressured to create more and spend less, there is little room for errors in firms' asset investment and risk management strategies. AIP software vendors are expanding their product portfolios to help customers optimize capital as well as operational expenditure. However, there are still challenges to be overcome for the AIP market to meet its forecast growth rate. Verdantix believes that both AIP software vendors and buyers have a major role to play on that front.

Vendors Should Take Advantage Of Industry Expertise, Partnerships And Technological Advances To Align Growth With Market Development

Recent operational pressures, such as the COVID-19 pandemic and COP26 climate change goals, have increased demand for AIP software. The Verdantix 2021 global operational excellence survey of 256 executives showed that over 20% of firms are looking to invest in or upgrade their existing AIP software in 2022. To support firms with ongoing operational pressures and grow market share, AIP vendors are deploying different strategies. These encompass:

- **Developing industry-specific workflows and inputs to include in models.**

Implementation strategies for long-term AIP projects invariably require industry-specific knowledge. In the 2020 Verdantix global corporate survey, 93% of the 259 executives interviewed stated that industry subject matter expertise was either 'very important' or 'important' when selecting a service provider for asset management projects (see [Verdantix Global Corporate Survey 2020: Operational Excellence Budgets, Priorities & Tech Preferences](#)). Copperleaf has developed specific inputs or libraries for electrical utilities and water industries, while Arcadis Gen has done the same for the transport sector, DIREXYON for municipalities and Endeavor for the nuclear sector. 1898 & Co. leverages engineering knowledge from its parent organization, Burns & McDonnell, to deliver industry expertise to its customers.

- Partnering with engineering/design providers for domain knowledge and implementation support.**
 In the 2021 Verdantix corporate survey, 65% of respondents said that they would use third-party consultants for long-term AIP projects, with consultants able to bring both IT and domain knowledge to the table. AIP software vendors are partnering with engineering firms to quickly develop domain knowledge. In 2019 Probit Consulting joined with AECOM to combine its optimization and advanced analytics capabilities with AECOM's engineering knowledge, to improve traditional inflow and infiltration management methodologies. **Infrastructure Solutions** has partnered with Golder and WSP for engineering analysis and to support post-deployment services. SimulAi, the official technology partner of The AnyLogic Company in the UK and Italy, has repackaged AnyLogic simulation software with additional consulting and implementation services to support a variety of use cases, including AIP. Siemens has likewise partnered with SimulAi to develop a digital twin of the entire fleet operations of its aero-derivative gas turbines, enabling its users to run detailed 'what-if' scenarios to aid investment decision-making.
- Making acquisitions to enhance functionality and target new markets.**
 To keep up with customer demand and successfully grow market share by expanding product functionality as well as reach, AIP software vendors have been undertaking acquisitions. Brightly Software entered the AIP market following its acquisition of Assetic in 2020. To further enhance its portfolio, at the end of 2021 Brightly acquired the asset management solution provider Facility Health. Not only does this acquisition provide Brightly with expertise in the healthcare industry, but it will also enable the firm to merge Facility Health's ability to use operational and real-time data for capital planning with the existing Brightly AIP offering, thereby enhancing its asset performance modelling capabilities.
- Utilizing ML and AI for enhanced offerings.**
 Across all industries, challenges surrounding missing data, or a lack of data, are slowing the adoption of digital solutions. Without a layer of data quality checks to ensure that all relevant data are acquired and are appropriate, the value of results obtained from software can be meaningless. Vendors are therefore turning to analytical modelling – and in particular, ML – to bridge the gap between operational and missing data, to ensure that relevant data are fed into AIP software. Arcadis Gen has created a 'data quality' component to its AIP workflow, which acts as a data hub, analysing all input data to ensure relevance. The component also identifies any missing data and uses ML to fill the gaps. Copperleaf has added ML to its product roadmap to support performance prediction and is using historical investment plans to build confidence in future plans.

Buyers Should Consider A Number of Factors Before Implementing AIP Software

The AIP market is growing, as vendors and solutions providers continue to expand functionality, industry coverage and partnerships. The number of firms looking to implement an AIP solution is expected to increase significantly over the next five years. To successfully deploy AIP software, customers must consider the:

- Current health of existing asset management strategies.**
 Implementing dedicated AIP solutions to support long-term investment planning and decision-making can be a time- and resource-intensive exercise, especially when a firm is unsure of the current maturity of its asset management practices. To ensure that their firms' AIP initiatives are successful, executives should identify the most critical areas for improvement. This could be achieved by benchmarking the current maturity and performance of their asset management practices against industry standards. Pragma, a

South Africa-headquartered EAM software provider, has an asset management improvement planning tool that helps firms define their ideal asset management strategy, assess the current processes they have in place, and identify gaps between the two, thus aligning potential investment plans with the strategic vision and objectives of the firm. By creating a health gauge of the current asset management status, and benchmarking this to hundreds of industry standards, a firm can see which key performance areas are undeveloped and therefore improve future investment decisions. Pragma's can be considered a prerequisite to traditional AIP solutions.

- **Breadth as well as granularity of the AIP solution required.**

With stakeholders pressed to do more with less, and with use-case-driven functionality impacting software usage, firms should consider the level of sophistication and breadth of capabilities required from their AIP solution. In some instances, customers may not need the full AIP suite. To cater to such customers, vendors such as Arcadis Gen and Ultimo are developing lightweight solutions that are more specifically targeted to customer needs. Ultimo's lightweight AIP offering, its Long-Term Asset Planning (LTAP) solution, creates high-level theoretical investment plans for a firm's most important assets, allowing maintenance teams to benchmark operational data and better validate long-term decisions. Asset managers can use LTAP to gain greater control of the investment process without disruptions to existing workflows. To promote a better user experience, Arcadis Gen is looking to create modular AIP solutions that cater to specific use cases such as risk management or ESG frameworks. Such a strategy will allow smaller firms to take advantage of AIP solutions earlier on in their digital journey, without having to commit large upfront investments.

- **Existing technology infrastructure and the time horizon of investment plans.**

AIP, APM and EAM software applications are heavily interlinked, with overlapping functionality and vendors offering varying capabilities. Firms looking to create asset investment plans dependent on operational data with strong EAM links over a time horizon of one to ten years should utilize solutions from vendors with strong asset performance modelling capabilities, such as AspenTech, Hexagon and Ultimo. The Hexagon software (HxGN EAM), bridges the gap between financial portfolio management and physical plant management to provide the most economically feasible maintenance plan. Its solution supports long-term planning over a one- to five-year horizon, with strong functionality for asset performance modelling. Firms looking to create asset investment plans that focus on asset end of life over a 20+ year horizon should utilize solutions from vendors with strong portfolio and asset lifecycle management modelling capabilities, such as Brightly Software, DIREXYON and Probit Consulting. Firms seeking strong operational consideration and asset lifecycle management should review firms such as 1898 & Co., Arcadis Gen, Copperleaf and **Infrastructure Solutions.**



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