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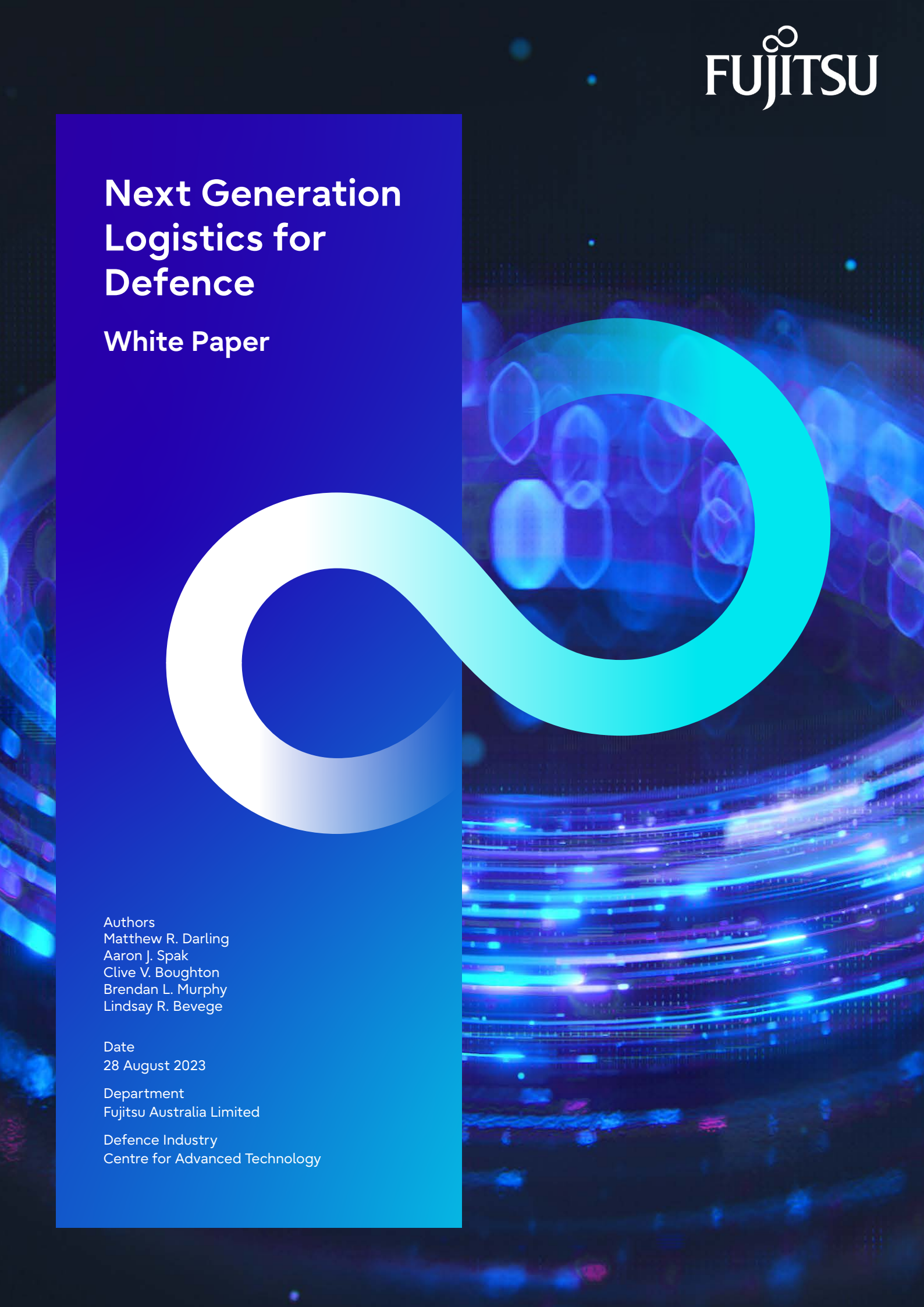
Next Generation Logistics for Defence

White Paper



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1. Abstract

As defence depends increasingly on sustaining complex, new and evolving warfighting systems, the need for effective and adaptable logistics grows ever more vital.

Current generation Enterprise Resource Planning/ Logistics (ERP/L) systems have been tried extensively, though many argue this is failing due to compromised usability as the systems grow and become difficult to navigate efficiently and effectively. ERP/Ls also quickly become incompatible with evolving enterprise processes because they are so complex and expensive to modify.

Research shows up to 90% of ERP/L deployments fail to improve enterprise efficiency. [i] This is despite ERP/L deployments typically requiring massive investment, often over a long duration.

Traditional ERP/L concept-of-operations consist largely of nested, tiered, and interlaced forms that makes system navigation complex.

Contrastingly, Next Generation Logistics (NGL) systems achieve improved efficiency, quality, resilience, and safety though enhanced usability.[ii] Usability is achieved through the proactive delivery of information, the orchestration of workflow, and monitoring against unambiguous and logical schedules.

The information environment in NGLs is optimised and presented in real-time for different user classes/ roles, filtered according to time and location, thus minimising or eliminating the time required for navigation.

- NGLs coordinate team activities by automatically generating, assigning, and sequencing tasks required for acquisitions, transport, storage, inventory monitoring, maintenance, deployment, and disposal. Users are provided decision support, prioritisation and the necessary instructions and visual references needed for safe and effective task completion.
- NGLs are a useful tool that support users completing complex, technically demanding tasks. Safety and quality acquittals, for example, are generated as a by-product of the same workflows that guide and support, rather than distract and confuse users.
- NGLs function on any networked device, including hand-held, to facilitate the provision and creation of data in real-time. Managers can better coordinate and support staff through dashboards that obviate issues as soon as they have been recorded, thereby enabling rapid and effective responses, all of which can be automated.

The barriers to producing and sustaining NGLs were very high due to the time and resources required to document and deliver workflow-enabled systems with many classes of user. However, with the advent of NGL foundry technologies, these barriers have now been effectively removed and the cost and risks associated with building such functionally rich systems have been greatly reduced. NGLs are built and deployed through a no code or low code process that also greatly improves system security, performance, and reliability.

Technical proofs conducted by the Fujitsu Australia Centre of Advanced Technology show NGLs provide a highly viable alternative to ERP/Ls for Defence (NGL-D) applications at a time of accelerating warfighting system turnover.

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2. Context: The problems of traditional ERP/L

The Russian invasion of Ukraine has seen the strategic advantages of vastly accelerated adoption of new warfighting systems and devices.

In a time of hastening technological turnover, traditional ERP/Ls become a liability because the time required to modify them to accommodate new systems, devices, supplies, maintenance protocols and deployment readiness is far too great.[iii, iv] This lack of agility results in ERP/L systems becoming separated from fundamental operational requirements.

Defence forces have invested tens, if not hundreds of billions of dollars, in traditional ERP/L over decades[v, vi] but without all the expected benefits.[vii, viii] In addition to the barriers to effective adoption experienced by commercial organisations, defence forces have additional challenges including conducting global operations in austere or denied environments, as part of a coalition force structure, and a rapidly changing operational environment, in addition to many others.

Research shows up to 90% of ERP/L deployments are a failure if the measure of success is an improvement in enterprise efficiency.[ix] This is despite ERP/L deployments typically requiring extensive investment and long duration.

Originally, ERP/L aimed to improve management performance through access to better information for resource planning, monitoring, and asset maintenance. This information underpinned improved decision-making in the refinement of assets and ways to support them, often through decades of service.

Another key objective of ERP/Ls was to provide a framework for operations and to provide records for retrospective analysis to enable continuous improvement. The business case for deploying ERP/L was the expected flow-through to efficiency and quality, thereby improving business performance.[x, xi]

Despite the availability of functional libraries, which is often a key selling point for expensive ERP/L licenses, the cost, risk, and effort required to adapt them to a customer's unique business processes is almost always vastly underestimated.[xii] Life-cycle costs of ERP/Ls tend to be very high, while frequently delivering less than the expected value in day-to-day operations.[xiii, xiv]

ERP/Ls gradually and continually expand throughout their periods of service. It is not uncommon that they reach a scale that makes them hard if not impossible for most users to navigate. Low usability diminishes protocol compliance in tasks such as handling, storage, maintenance, and the creation of records. Users report that the ERP/L becomes a distraction from the task associated with the assets it is supposed to be supporting.[xv]

Additionally, studies show that data collected and stored in ERP/Ls is unreliable. This stems from the difficulty users have in entering and retrieving data (processes usually done at a desk and in retrospect). ERP/L provides minimal quality control mechanisms and almost no support for real-time data collection.[xvi]

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ERP/L vendors frequently propose Business Intelligence (BI) add-ons as a solution to data quality problems, despite the fact that an inaccurate dataset is unlikely to yield valuable insight, no matter the capability of the BI tool(s) applied to it. Data quality problems caused by these weaknesses can, in fact, be magnified when used with powerful analytic tools, potentially misleading decision-makers.

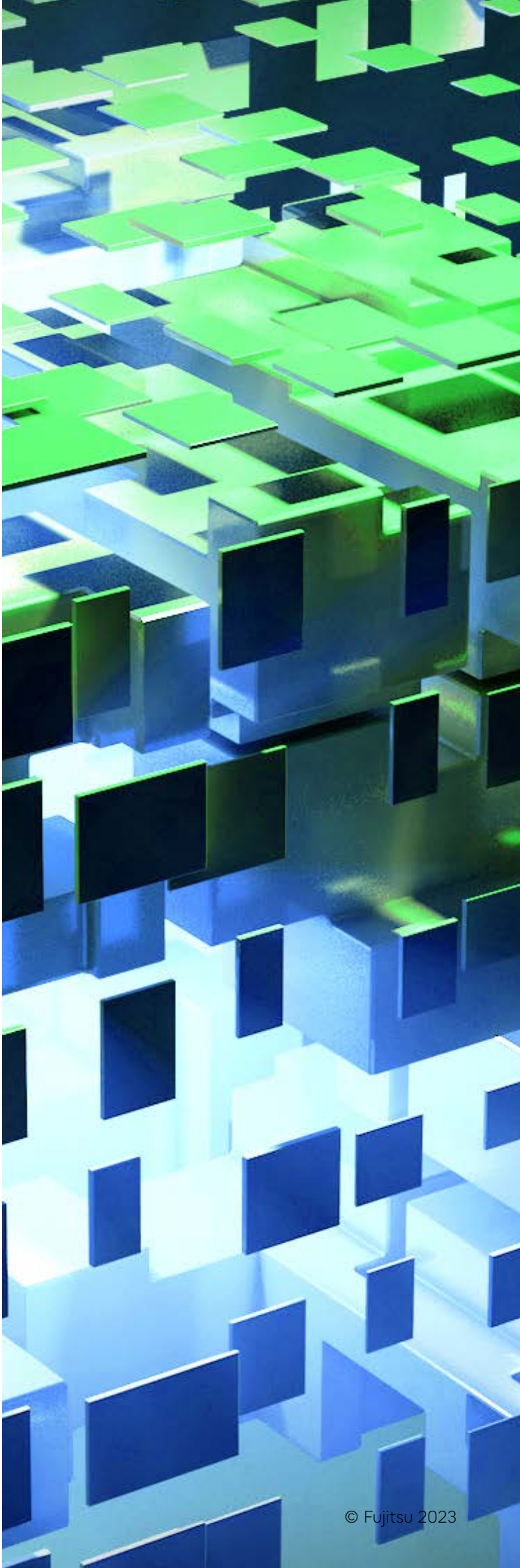
The complexity of using ERP/Ls also drives dependence on expert human resources who are capable and willing to use them.[xvii] The high cost of the need to continually grow, fix and improve ERP/Ls is compounded by the need to retain expert users, trainers, and managers.

Resource drains are further increased by the need for ongoing organisational and process changes, though by the advanced stages of ERP/L deployment, management are often so invested that they can see no alternatives than to keep going.[xviii]

The ultimate cause of operational failures is the traditional, tiered, and hierarchical structure of ERP/Ls. This is the result of evolutionary development approaches since the advent of material requirements planning (MRP) systems in the 1960's. Since that time, functionality has been added or integrated as enabling computing technology has matured, and as the companies that developed these solutions have been acquired or divested. Since they have been developed to broadly address customer needs, they are (by definition) not tailored around a specific organisation's processes nor oriented towards their objectives. Therefore, complex customisations are employed to bridge the gaps and the burden of sustaining those customisations fall on the organisation itself. The delivery failures proceed from the complex and limited means of customisation needed when it is discovered the functional libraries do not meet the organisation's needs.[xx]

An additional challenge associated with ERP/L is the equally complex governance structure used to manage the technology and associated customisations. These governance models, particularly in public sector or defence applications, are rigid and expensive. Therefore, innovation is at best stifled or at worst blocked and additional systems are purchased or built to make up for the lack of functionality in the core ERP/L. In fact, Gartner finds that "organisations that structure their ERP governance body for administrative oversite, concentrating on short-term execution decisions, fail to deliver strategic business outcomes."[xxi] The realisation of benefits and the efficacy of governance is constantly hampered by the ongoing technical debt inherent in ERP/L.

ERP/Ls owners are increasingly seeking to take advantage of new innovations such as in-memory databases, AI, microservices-based architectures. However, after many years of investment in ERP/L, organisations are often left with an overly complex, non-intuitive Gordian Knot of business applications that is expensive to sustain and which may not be providing the desired business value.[xxii, xxiii]



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3. The Advanced Software Engineering that enables NGL

Despite ongoing research, commercial practices in software development are relatively arcane and generally lacking in significant innovation. Many of the same techniques that were common over 30 years ago continue to be used today. Most software practitioners work within an envelope of one or more belief systems, which customers are told are scientifically derived and proven, though the track-record of complex software projects around the world tells a different story.

Requirements elicitation techniques have improved, though programmers still overwhelmingly apply programming syntax to develop systems. Syntax may offer a vocabulary of functions, but one which may be inconsistently applied leading to defects and inconsistencies, and as a system is maintained 'brittleness' increases.

NGL provides methods and systems that resolve the tension between scale and reliability, by reconciling the loosely coupled but distinct processes of software development:

- Understanding requirements;
- Analysis;
- Architecture;
- Execution; and
- Verification

The lack of close coupling of these processes in current practice certainly contributes to high costs and low quality and safety. Even when the most diligent attempts to better couple initial requirements and architecture are executed, the relationship between them becomes more tenuous with time and sustainment.

Change and the lack of synchrony and completeness in the processes are the main reason that initial requirements become disconnected from the end product. While production systems have occasionally been initially well received, the maintenance of the product inevitably becomes difficult and expensive, even with modest enhancements and fixes.

Analysis of the potential effects of changes become very time consuming, and often impractical, leading to great difficulty in cost estimation and unanticipated defects.

NGL was built to establish and maintain the coupling and ongoing alignment between the various products of essential software engineering activities. It was also designed to more easily, and meaningfully, analyse requirements and state them in a connected, testable form.

NGL, in addition to closely coupling or even integrating separate processes (bulleted above) enables the discovery of models with broad applications (meta-models) and greatly reduces the need for programming.

Traditional systems development relies on hand-coding and functional libraries. Syntactic inconsistencies by coders and in libraries result in risks, defects, protracted timeframes, and excessive resource consumption.

Every new system starts with a method. NGL leverages Information Environment Analysis (IEA). IEA uses the information environment, such as an existing ERP/L, and applies the NGL prism of technical feasibility to it in structured consultation with expert stakeholders. This translates the organisation's knowledge and processes into an efficient, reliable, and augmented NGL capability, able to better support deployment readiness and operations.

The foundation of NGL is an application-level foundry, enabling low-code and rapid development. The foundry generates configuration files that plug in to an underlying meta-model. This imparts exceptional reliability into applications built from it.

NGL is adaptable to changing user requirements, with changes implemented predominantly through configuration, rather than coding. This is an essential feature to future-proof the application enabling the owner to continuously update it to satisfy evolving requirements.

System requirements change over time and the pace of this change is accelerating. Traditional systems are weakened by these changes, which take them on a pathway to redundancy. While traditional ERP/L systems are continuously updating capability from behind, NGL provisions the ability to meet new requirements proactively as a fundamental part of the architecture. The result is a capability that can respond as fast as conditions change.

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NGL project delivery shows that the following software engineering benefits arise:

Clear and well abstracted analysis models

Increased productivity (by factors of 6-10)

Properly maintained system documentation

Greater flexibility and robustness (as a co-efficient)

Early verification and validation (setting the correct basis for development)

Greater quality

More efficient and timely delivery

The output of the NGL foundry includes the system and documentation, which are maintained in perpetual alignment.

Modularity and configurability as design paradigms are becoming more common in complex systems. From weapons systems such as the Littoral Combat Ship (LCS) which is composed of mission modules tailored for a specific deployment to microservices based architectures, this approach provides system agility and resilience. These are fundamental to NGL.

Critical to the success of NGL is the ability to configure and reconfigure the application rapidly, effectively, and as extensively as needed. Studies of NGL deployed in Health (NGL-H) care settings have yielded undeniable results.

The numbers below reflect the outcomes of a deployment in a NGL-H where 24/7 health logistics operations, co-ordinating an entire institutional workforce of 65 health care professionals, where safety-criticality is required.

Table 1: Technical performance of NGL-H in deployment since go live on 17/07/2019 to 21/01/2021

Focus	Metric	Performance
Reliability	Unplanned outages	0
Usability	Calls to the 24/7 help desk	3
Security	Penetration / Breach	0

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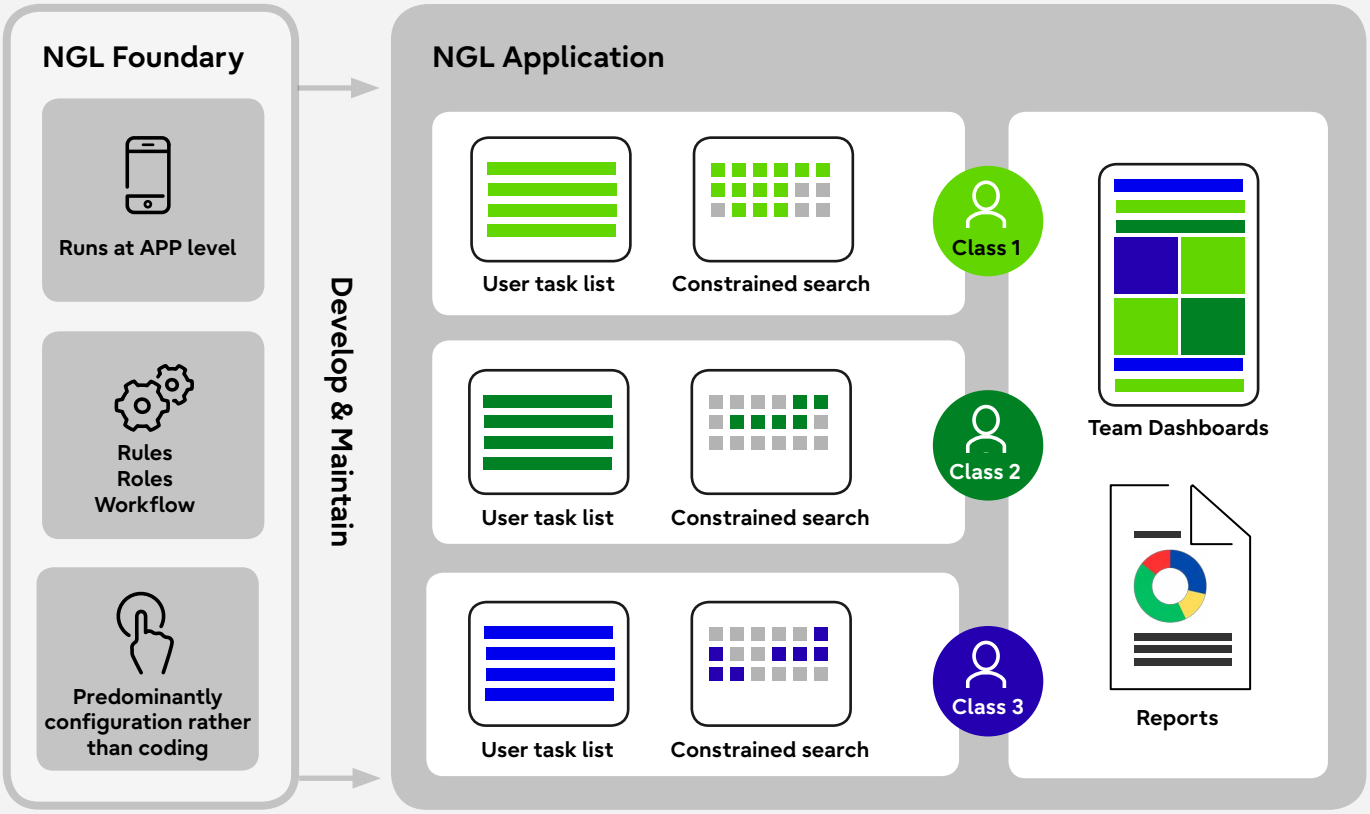
3.1 NGL: Summary of Core Functions and Structures

The NGL Foundry offers a unique library and structure to the application which builds the information environment around each class of user, comprised of the following structures:

- Tasks;
- Workflows;
- Constrained searches;
- Dashboards; and
- Reports against performance or quality indicators.

A simple graphical depiction of the NGL foundry and its relation to NGL applications is below.

Figure 1: NGL Foundry Development Stack



The NGL foundry is an application-level configurator that can be used by Business Analysts (not software engineers) to create new NGL applications and their associated documentation without the need for highly skilled software engineers or developers.

The NGL foundry and any application built using it never really separate. Ongoing evolution is foundational to NGL. As platforms evolve and are deployed, so NGL readily adapt to keep pace with situational requirements and tactical opportunities.

NGLs (and business applications in general) reimagine development and sustainment processes to enable resilience, agility, cost-effectiveness, and most importantly, directly enable efficient and effective business process execution. It achieves this by shifting the paradigm from a monolithic application to a flexible approach which applies technology to business problems as part of a coherent enterprise strategy. Gartner terms this approach a ***composable ERP,*** which is an adaptive technology strategy that enables the foundational, administrative, and operational digital capabilities within an enterprise to keep up with the pace of business change. [xxiv] The NGL described in this white paper is an embodiment of this vision that focuses on operations first.

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NGLs were pioneered for safety-critical operations in complex health care environments where they have been proven to improve safety, quality, and efficiency simultaneously.

NGL has a focus on day-to-day logistics as starting point. By starting with operations rather than record keeping as a foundational principle, complexity is both understood and managed from initial deployment. Traditional ERP/L design starts at the record and moves towards operations.

The ability to deliver information to users as and when they need it is a fundamental NGL principle, submerging the complexity of workflows under an intuitive User Experience (UX). This is achieved through the embodiment of protocol through easy to use, yet comprehensive multi user-class workflows that co-ordinate the many disciplines embodied in the NGL. The ability to deliver information to users as and when they need it is a fundamental NGL principle, negating the complexity of workflows in a conventional embodiment.

Rather than having multiple user classes navigating the system in essentially the same way, the information environment in NGL is assembled in real-time for different user classes, thus minimising time spent on searching for forms to input or retrieve information.

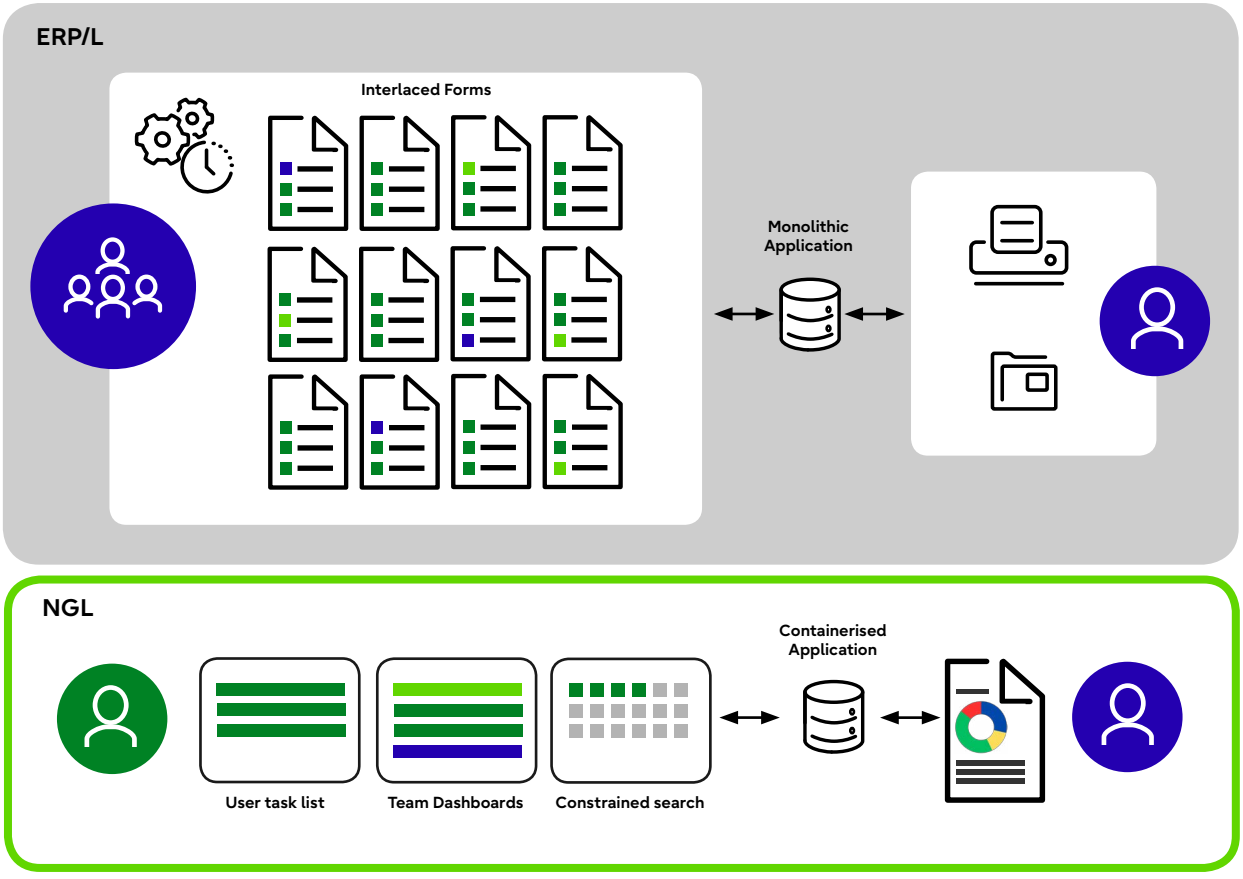
NGL also does the heavy lifting of logistics management by automatically generating, assigning, and sequencing tasks required for acquisition, transport, storage, inventory monitoring, maintenance, deployment, and disposal. Users are provided with decision support, including the necessary instructions and visual and other references needed for completion.

This concept-of-operations stands in complete contrast to the traditional tiered, nested, and hierarchical navigation required to use an ERP/L. NGL proactively delivers reports in the form of dashboards, supporting real-time responses to emerging issues by management and staff.

NGL can run on any networked device, including portable hand-held hardware such as smartphones and tablets due to simplified navigation. Some applications, such as review of complex portfolio data, is better suited to laptops or desktops with large screens. Different organisations can benefit from a tailored device mix.

The contrast between the traditional system concept of operations and the next generation required for NGL is shown diagrammatically below.

Figure 2: Traditional ERP/L Concept of Operations v NGL



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4. NGL: Enterprise Operational Benefits

The evaluation shows workflow automations, including generating, assigning, and sequencing tasks based on outcomes dramatically improves procedural compliance and therefore safety. [xxv]

By automating workflow and record-keeping, NGL aligns this improvement in quality with the efficiency objective, so that the high-quality enterprise operations are actually less expensive than lower quality ones.

NGL-H has been proven to drive efficient use of resources, both in the management of assets and in time required by users to complete enterprise operations and to find and create records. Independent university studies of NGL developed for the health sector, using time and motion recording, show 20% time saving on data entry, general record keeping and data retrieval.[ii] Therefore systematising and supporting processes in real-time, data accuracy is significantly improved.[xxvi]

Usability is not just a matter of convenience. NGL is designed so that users want to use it because it helps them to do their job. That is the core principle of user-driven engineering and is critical to ensuring accurate, comprehensive data is collected.

Time and motion studies proved that the use of NGL-H led to an increase in subject evaluations from 38% to 94%, with data collection shifted to real-time. The evaluation team found that the UX delivered by the foundry was highly intuitive and easy to use and was far better than the existing systems.[xxi]

Safety is a key consideration in NGL-H. The evaluation team found that the greater control over logistics and the ability to precisely characterise the status of users and assets with a set of facts (location, maintenance assessment outcomes, risk level) and to draw on decision support (e.g. safe handling guidelines) would assure best practice safety standards.

Contrasting with traditional tiered and hierarchical systems, safety protocols were found to be embodied in a way that mitigated human error. Key information was proven to be more effectively presented and transferred between users, due to the NGL process of tasks flowing between specific user types.

Dashboards for team coordination were found to be excellent safety features, which elevated the application over a system of record to the level of a real-time team coordination system.

Table 2: NGL-H Impacts on quality, safety, and sustainability

Focus	Impact[ii]
Time spent by users completing documentation	Reduced from 20.4% of user time to 6.4% – time now available to spend on enterprise activities
Time spent by users searching for documents	Further saving of 6% of nurse time, bringing the total time saved to approximately 20%
Incidents of missed operations	Reduction of >20% – effectively eliminated
Completion of mandated assessments	Increased by 40%
Subject evaluations	Rose from 38% to 94%
Effectiveness of work	Rose from 31% to 88%

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NGLs, characterised by active workflow co-ordination and automated data presentation were also shown to vastly increase data quality. [xxvii]

Figure 3: NGL Foundry/Application Features and Benefits Relationship

4.1 NGL Application: Summary of Technical Capabilities

Usability and adaptability are important, but mature NGL has many other distinguishing capabilities, including:

- Microservices architecture, containerisation, leveraging the power of secure cloud;
- Internal Point-to-Point encryption to optimise security;
- Table extensibility, reducing the risk and expense of system extension;
- UI formatting, enabling compatibility smartphones, tablets, and desktops;
- Journalling, such that any attempt to alter records can be discovered;
- User identity logging, creating or altering records;
- Time:date stamp records, including any changes made to those records;
- Permissions, supporting a large number of user classes;
- Constrained search, keeping data secure and limited by User Classes;
- Logical input limiter; preventing order-of-magnitude input errors;
- Automated decision support;
- Prompt data collection and allow easy data input;
- Encrypted connection to Charged Coupler Devices (CCD) on mobile devices;
- Secure storage for attachment such as contracts and specification sheets; and
- Stack portability, the ability to move between different types of cloud and relational databases.

Through these features NGL meets or exceeds modern standards for architecture. System development is ISO27001 certified, meeting a key security standard.

The micro-services architecture provides platform agility while facilitating integration with other systems. Stack portability is useful when organisations want to leverage existing licenses or Business Intelligence (BI) licenses or capabilities.

The capabilities described above facilitate measurable outcomes, though building NGL through traditional development would be so resource-intensive that it would be infeasible.

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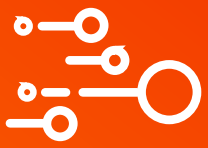
5. NGL-D: Proof-of-Concept (PoC)

The Fujitsu Australia Centre of Advanced Technology adopted a 'test-drive' method for the NGL-D PoC. Representative use-cases were developed to assess whether NGL can offer reasonable proof of delivery capability under very tight timelines. The use cases were not prescriptive technical specifications, however described business processes to be achieved using the NGL.

Specifically, the PoC would evaluate:

Fitness for purpose

Usability



Speed of configuration

Fitness for purpose testing, in this case, refers to whether the foundry can be proven to be successfully used to build an application that meet ERP/L requirements, while adding NGL benefits.

For usability, Fujitsu Centre for Advanced Technology evaluated whether the foundry systems and methods offer a practical and intuitive UI and toolset that users would feel confident to learn and apply. The training burden for new users was also a critical factor in the evaluation.

An aggressive timeline of 8 weeks was imposed on the PoC to rigorously test the level of agility in the NGL stack.

5.1 PoC Outcomes

Analysis of the PoC shows that the NGL candidate delivered against both logistics performance and system performance requirements.

The PoC was delivered on time and on budget. This included iteration and clarification of deliverables for each specified use case.

The PoC enabled receiving of new platforms, automated platform maintenance protocols and the archetypal structures and instances of depot management.

The NGL embodied key use cases currently managed using a conventional ERP/L and easily outperformed the existing ERP/L on all criteria.

The NGL foundry delivered the initial build in 3 weeks, including all the fields, forms, assessments, and workflows embodied in the four use cases.

Feedback from the evaluation team, including refinement of the use cases and queries about system use ran continuously over the next 5 weeks, enabling the team to test the power of the system configurability. This approach also reflected the development process that is planned for a production build.

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For the high-level requirements, the following conclusions were reached in the detailed evaluation of the PoC:

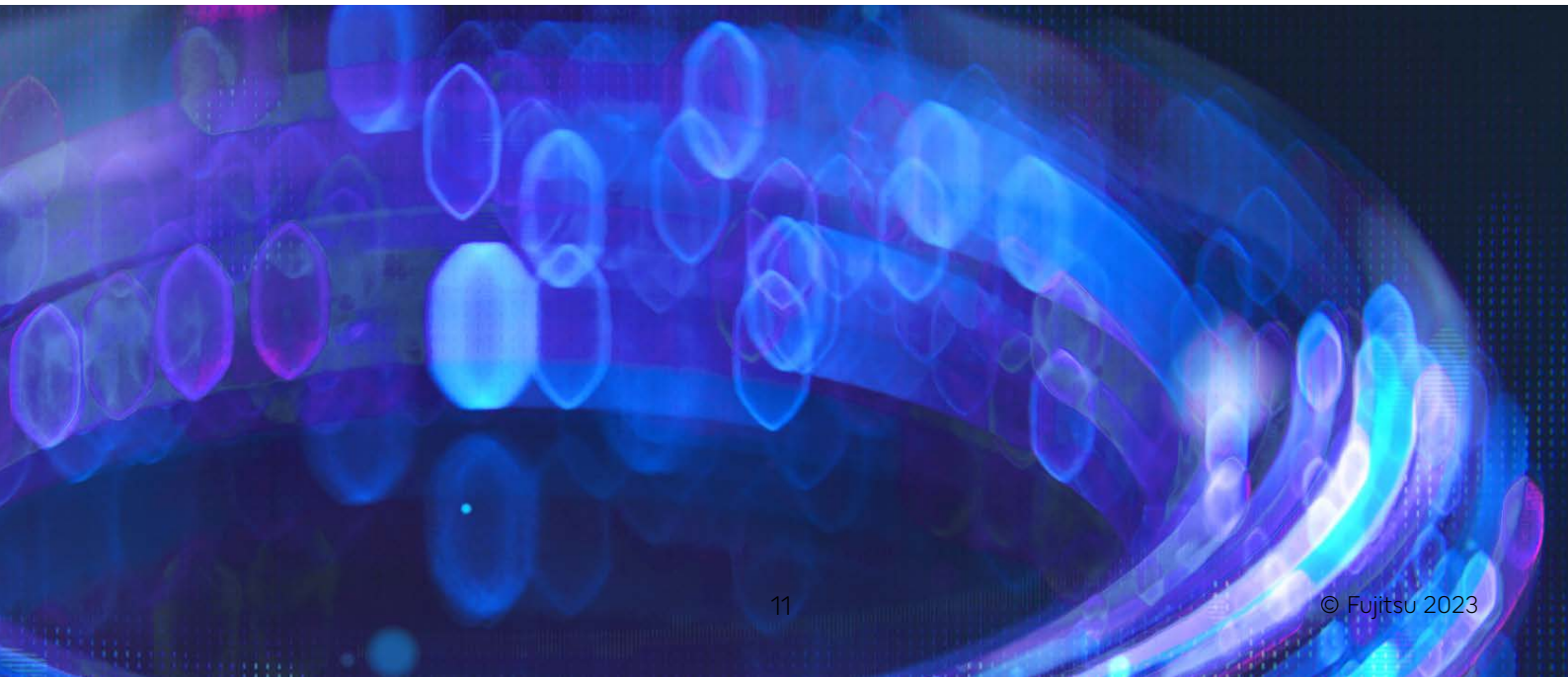
On the specific functionality of the four case studies, the evaluation team scored each function on an ascending score from 0 to 3, with 3 indicating the functionality was fully delivered. On this basis, the system scored 58 out of a possible 63 (92.1%), with no score less than 2. This was an exceptional outcome for any system, let alone one that was deployed entirely by configuration, and which was not previously developed for these use cases.

Of twenty issues initially marked as not delivered by the assessors during the course of the evaluation, fourteen were fixed to their satisfaction before the evaluation was completed, mostly by simple configuration changes or minor bug fixes.

Only three items of functionality requested would require minor coding to implement, although alternative pathways were also available by configuration. The remaining three items concerned workflows not originally envisioned in the use cases, but which became apparent during the evaluation. The evaluation team found that these could be incorporated into the specifications for the production build and delivered without difficulty.

Over the last 12 months the Fujitsu Australia Centre for Advanced Technology has been investigating the potential of NGLs through rigorous tests and analysis, culminating in the build of a Proof-of-Concept (PoC) NGL. This PoC was completed within 8 weeks, including build, scoping and analysis, establishing the speed of the NGL foundry.

Expert users of traditional logistics systems tested the NGL prototype and gave it a 92.1% rating against the evaluation proving the NGL concept of operations to be fit for purpose. Uptime for other production systems using the NGL stack exceeds 99.9% demonstrating the reliability of NGL.



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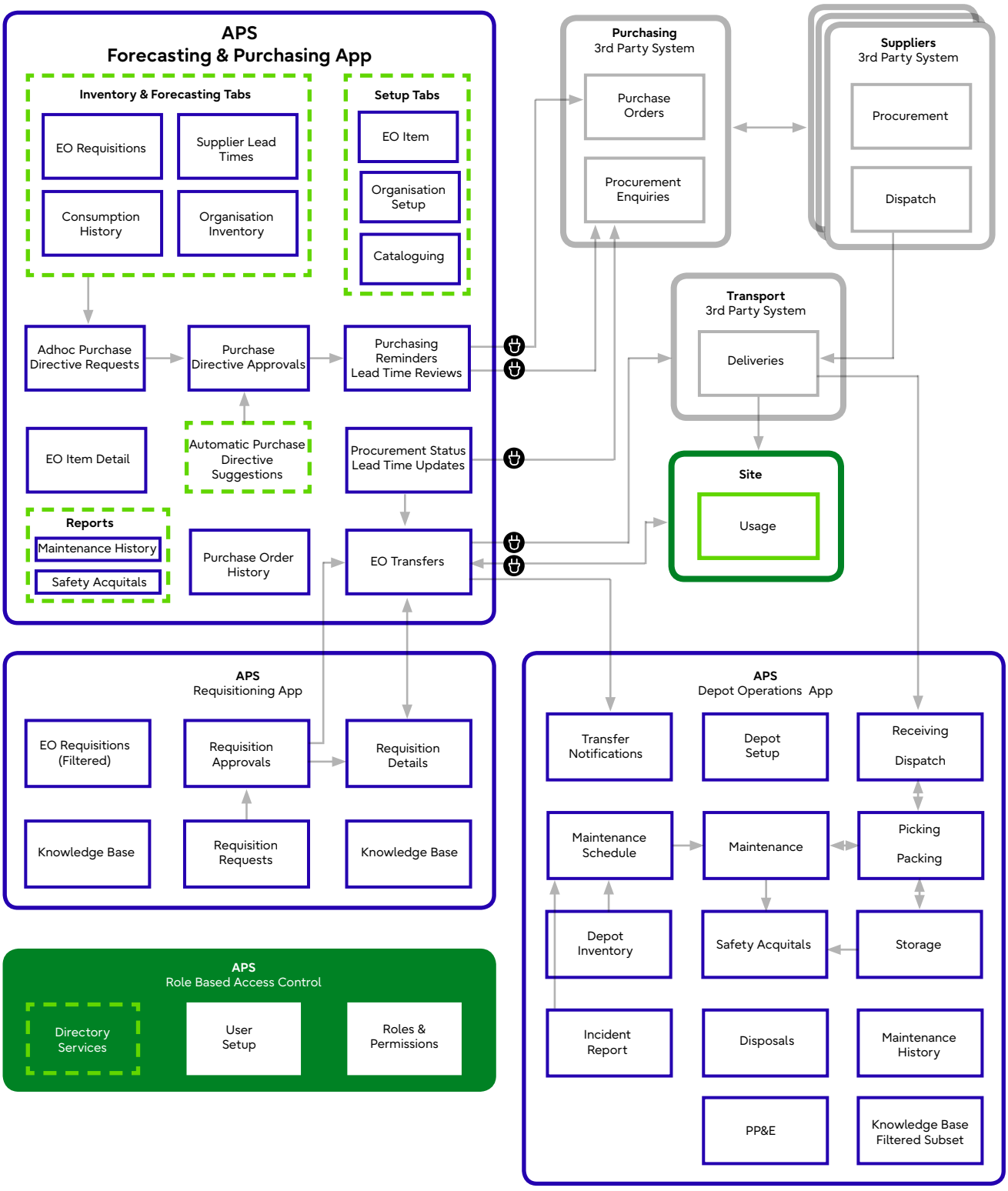
5.2 NGL Production Build

Based on the success of the PoC, the Fujitsu Centre for Advanced Technology is progressing with a production build as a demonstrator to one of its Defence clients. A challenging timeline of 3 months has been set for the production build to confirm the foundry's ability to dramatically reduce the time, cost and risk involved in an NGL compared to traditional ERPs.

The production build had started at the time of writing this paper. It is progressing on time and on budget but is not yet complete.

Figure 4: Alpha Production System (APS) Diagram



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5.3 Independent appraisal of the NGL Stack by Dr Clive Boughton

The NGL stack produces systems that perform sets of given/required tasks reliably and well, but also provide a very high level of operational changeability to enable human users, involved with the associated tasks, to easily adapt the system to incorporate new tasks and rules of operation.

Underpinning the NGL system is a configurable event-based, workflow engine that can be used in any domain including health, business, defence, security, enterprise resource management and that would benefit from complex workflow and adaptability.

To achieve the excellent outcome surrounding the development of the NGL system, required a very high capability to analyse and to abstract the fundamental ingredients of event-based workflow and configuration.

NGL embodies the best Model-Driven Development (MDD) approaches to build the foundry. However, to produce a general event-based workflow configurability required an uplift in the thinking behind MDD - these modellers were equipped to achieve that. These exceptional software engineers have actually produced a system that enables the building of other systems, such that the benefits listed above are even more highly pronounced. They no longer rely on the established MDD approaches that constituted what was best practice but have now provided the capability to think and adapt any workflow or case management system through analysis of essential characteristics of new problem spaces/domains and so produce effective workflows and configurations - the universal building blocks, including meta-models, to enable most systems we can currently envisage requiring human interaction.

NGL has solved an underlying problem that has plagued nearly all interactive software systems - the ability to cater for the wiliness and idiosyncrasies of human behaviour such that users no longer need to spend significant amounts of time training to use a system that is almost entirely foreign to them, but rather play to the needs and interests of all concerned with the system. The NGL solution addresses the real problems that users (in practically any domain) face and so enables quick and effective integration into users' operational environments. When a system takes less than a day to learn and resolves serious, key operational handicaps, then it is solving 'real' problems - and not creating new ones. Finally, the essential steps of Software Engineering are systematised into a closely-coupled readily executed and streamlined set of methods and tools.

The (advanced) NGL approach to building effective, interoperable and sustainable software solutions for all sorts of applications and domains is a significant development in the context of the history and future of Software Engineering.

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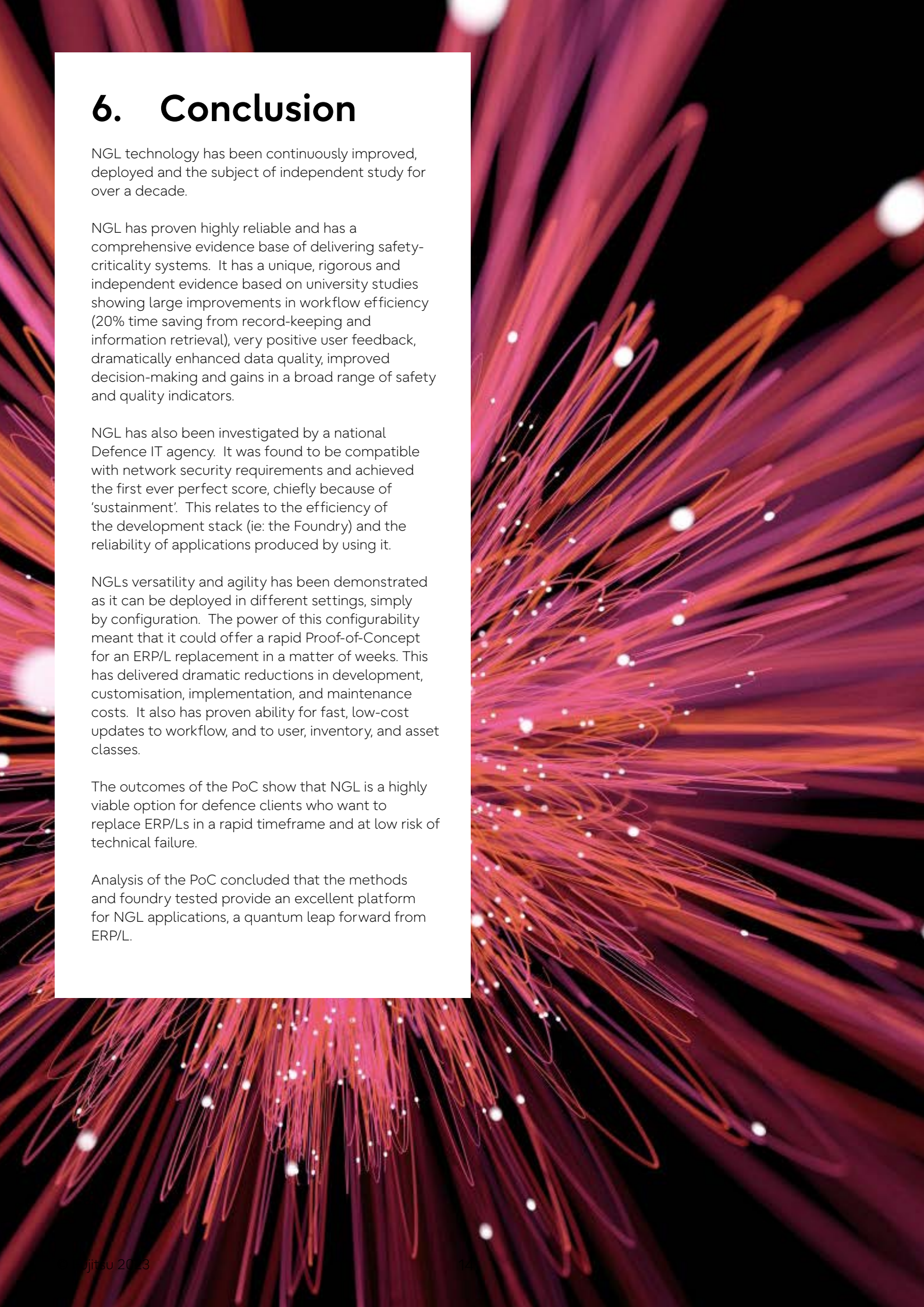

6. Conclusion

NGL technology has been continuously improved, deployed and the subject of independent study for over a decade.

NGL has proven highly reliable and has a comprehensive evidence base of delivering safety-criticality systems. It has a unique, rigorous and independent evidence based on university studies showing large improvements in workflow efficiency (20% time saving from record-keeping and information retrieval), very positive user feedback, dramatically enhanced data quality, improved decision-making and gains in a broad range of safety and quality indicators.

NGL has also been investigated by a national Defence IT agency. It was found to be compatible with network security requirements and achieved the first ever perfect score, chiefly because of 'sustainment'. This relates to the efficiency of the development stack (ie: the Foundry) and the reliability of applications produced by using it.

NGLs versatility and agility has been demonstrated as it can be deployed in different settings, simply by configuration. The power of this configurability meant that it could offer a rapid Proof-of-Concept for an ERP/L replacement in a matter of weeks. This has delivered dramatic reductions in development, customisation, implementation, and maintenance costs. It also has proven ability for fast, low-cost updates to workflow, and to user, inventory, and asset classes.

The outcomes of the PoC show that NGL is a highly viable option for defence clients who want to replace ERP/Ls in a rapid timeframe and at low risk of technical failure.

Analysis of the PoC concluded that the methods and foundry tested provide an excellent platform for NGL applications, a quantum leap forward from ERP/L.

References

[i] Ramesh, Nagesh & Delen, Dursun. (2021). Digital Transformation: How to Beat the 90% Failure Rate? IEEE Engineering Management Review. PP. 1-1. 10.1109/EMR.2021.3070139.

[ii] Bail, K, Merrick, E, Gibson, D, Strickland, K, Smith, B, Hind, A, Vann, B, Thomas, N, Paterson, C & Redley, B 2020, Evaluation of ACE in Residential Aged Care: the impact of a digital point-of-care system on residents and staff. University of Canberra, Australia.

[iii] A. Amado and F. P. Belfo, "Maintenance and Support Model within the ERP Systems Lifecycle: Action Research in an Implementer Company," Procedia Comput. Sci., vol. 181, pp. 580–588, 2021.

[iv] S. Demi, M. Haddara, Do cloud ERP systems retire? An ERP lifecycle perspective, Procedia computer science, 138 (2018) 587-594.

[v] IBM scores second Defence ERP deal for $128 million, itnews, Apr 20, 2021. Available at: https://www.itnews.com.au/author/justin-hendry-1167397

[vi] Australian Government Defence Website. Enterprise Resource Planning Program. https://www.defence.gov.au/business-industry/industry-capability-programs/enterprise-resource-planning-program (Accessed: 24 August 2023)

[vii] Kimberling, Eric. (2021) $5Bn US Airforce ERP failure. Available at: https://www.linkedin.com/posts/erickimberling_lessons-from-the-us-air-force-erp-failure-activity-7038139339452674048-T79m/ (Accessed: 24 August 2023)

[viii] Songini, Marc L. (2005) GAO Says Navy Sank $1B Into Four Failed ERP Pilot Projects. Computer World, November 14. Available at: https://www.computerworld.com/article/2559389/gao-says-navy-sank--1b-into-four-failed-erp-pilot-projects.html (Accessed: 18 August 2023)

[ix] Ramesh, Nagesh & Delen, Dursun. (2021). Digital Transformation: How to Beat the 90% Failure Rate? IEEE Engineering Management Review. PP. 1-1. 10.1109/EMR.2021.3070139.

[x] Goundar, Sam & Khan, Rukshar & Singh, Ravinesh & Lal, Shivanesh & Lal, Geol & Singh, Siddarth. (2021). Impact of ERP Systems and ERP Capabilities for Organisational Success.

[xi] Azhar, Zubir & Quah Wei Jie, Kenny & Goh, Jing. (2022). Cloud ERP and Value Creation: A Case Study of EngCo. Global Business and Management Research: An International Journal. 14. 357-370.

[xii] Wong, Ada & Scarbrough, Harry & Chau, Patrick & Davison, Robert. (2005). Critical Failure Factors in ERP Implementation. 40.

[xiii] Lakshmana Rao, Udandrao. (2018). A1. ERP Implementation Facts & Costs.

[xiv] Micheni, Elyjoy. (2020). ERP Software Maintenance. 10.4018/978-1-5225-7678-5.ch012.

[xv] Hecht, Sonja & Wittges, Holger & Krcmar, Helmut. (2011). IT capabilities in ERP maintenance - A review of the ERP post-implementation literature. 19th European Conference on Information Systems, ECIS 2011.

[xvi] Coşkun, Evren & Gezici, Bahar & Aydos, Murat & Kolukısa, Ayça & Garousi, Vahid. (2022). ERP failure: A systematic mapping of the literature. Data & Knowledge Engineering. 142. 102090. 10.1016/j.datak.2022.102090.

[xvii] Alzahrani, Ahmed & Mahmud, Imran & Ramayah, T. & Alfarraj, Osama & Alwadain, Ayed. (2021). End users' resistance behaviour paradigm in pre-deployment stage of ERP systems: evidence from Bangladeshi manufacturing industry.
Business Process Management Journal. 27. 1496-1521. 10.1108/BPMJ-08-2019-0350.

[xviii] Rajapakse, Duminda & Thushara, S. (2023). Critical Failure Factors in ERP Implementation: A Systematic Literature Review. Journal of Business and Technology. 7. 65. 10.4038/jbt.v7i1.109.

[xix] Jacobs, F. R., & Weston, Jr. , F. (2007). Enterprise resource planning (ERP) - A brief history. Journal of Operations Management, 25, 357-363.

[xx] E. J. Martins and F. B. Belfo, "Major concerns about Enterprise Resource Planning (ERP) systems: A systematic review of a decade of research (2011-2021)," Procedia Comput. Sci., vol. 219, pp. 378–387, 2023.

[xxi] Nguyen, D., & Faith, T. (2021). The Collective Governance for Composable ERP Deployment. Gartner.

[xxii] E. Hustad, M. Haddara, and B. Kalvenes, "ERP and organisational misfits: An ERP customisation journey," Procedia Computer Science, vol. 100, pp. 429-439, 2016.

[xxiii] Hansen, Hans & Haddara, Moutaz & Langseth, Marius. (2023). Investigating ERP System Customisation: A Focus on Cloud-ERP. Procedia Computer Science. 219. 915-923. 10.1016/j.procs.2023.01.367.

[xxiv] Faith, T., Torii, D., & Schenck, P. (2020). The Future of ERP is Composable. Gartner.

[xxv] Bail, K, Gibson, D, Hind, A, Strickland, K, Paterson, C, Merrick, E, Gibson, J, Kozlovskaia, M, O'Dea, A, Smith, B & Redley, B 2023, "It enables the carers to see the person first': Qualitative evaluation of point-of-care digital management system in residential aged care', Journal of Clinical Nursing, vol. 32, no. 1-2, pp. 174-190.

[xxvi] Redley, Bernice & Botti, & Considine, Julie & Coleman, Kimberley. (2014). A novel electronic nursing information and documentation system impacts nurse workflows. 10.13140/2.1.1723.5522.

[xxvii] Bail Kasia, Davey Rachel, Currie Marian, Gibson Jo, Merrick Eamon, Redley Bernice (2020) Implementation pilot of a novel electronic bedside nursing chart: a mixed-methods case study. Australian Health Review 44, 672-676.

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