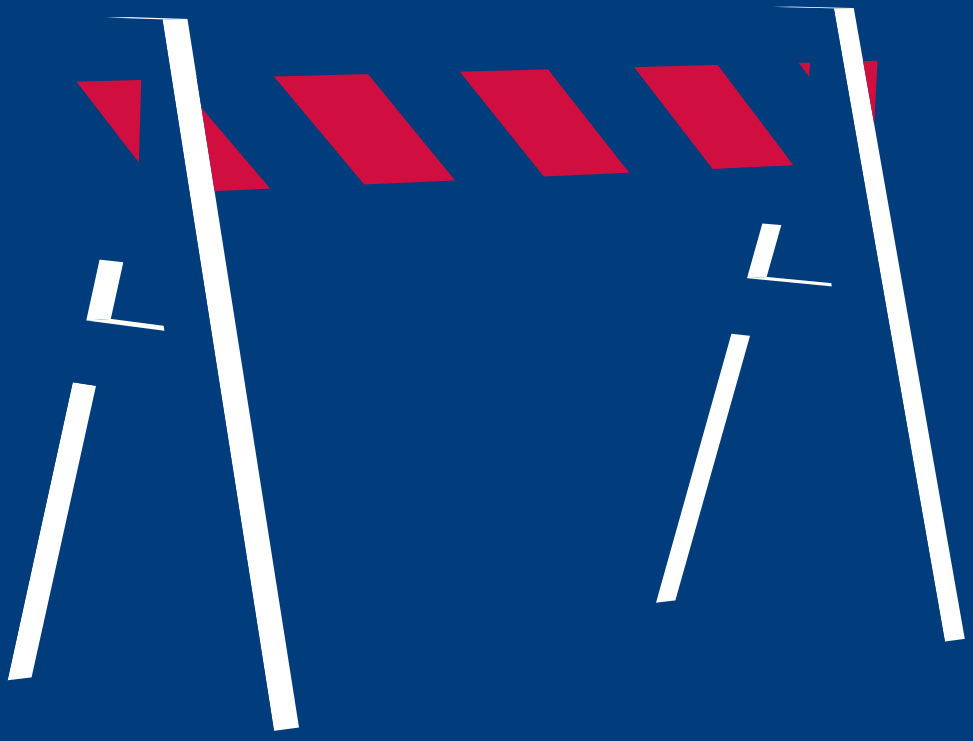
UNIVERSITY OF SURREY

ESCAPING LEGACY

Removing a major roadblock to a digital future



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EXECUTIVE SUMMARY

Core legacy systems inhibit business' ability to meet changing customer demands in the digital age. The scale and nature of the problem is such that it needs to be addressed now. Our Survey suggests that it is addressable without the need for large-scale multi-year programmes to re-write these applications

According to a senior executive survey of leading financial, industrial, government and IT services organisations conducted by the University of Surrey in early 2016, some 40-50% of all IT assets are in urgent need of modernisation. In the case of the UK alone this represents a technology debt estimated to be in the tens of billions of pounds, somewhat equivalent to our national pensions deficit.

Digital disruption is now clearly visible in virtually every sector of the economy, accelerating at a pace not seen in any previous era of technology-induced change. Such disruption is largely associated with the explosion of mobile devices and real time transactions, underpinned by cloud services, that traditional batch systems were not designed to accommodate. The advent of the Internet of Things, data analytics and machine learning will further widen the current performance gap here.

Much IT investment has taken place at the front end of organisations to support the growing customer demand for digital services, but the core systems that form the foundation of any IT estate are unable to evolve at sufficient speed to respond to the digital tsunami cascading down the supply chain. In particular, the IT sector itself is being rocked by the new public cloud phenomenon that is transforming services in a fundamental way. Analysts such as Gartner anticipate that 50% of all internal IT and business services will migrate to the public cloud by 2020.

Although many core systems have become efficient and stable over the many decades of their existence (dating back in many cases to the 1970s and 1980s), they are now seen as a key obstacle in the rapid evolution to a fully integrated digital business. A senior automotive executive expressed the problem clearly in his statement 'software is the new rust'.

Despite these seismic changes taking place across the new digital economy, our survey reveals that the majority of Boards remain largely passive in the face of this legacy issue. They see the process of fundamental systems modernisation as overly complex, too costly and involving unacceptable levels of risk. Only a cataclysmic event such as a full scale public outage (as experienced by RBS in 2011) appears to elevate this topic to the board agenda.

In this context, all evidence suggests that legacy extends well beyond the boundaries of technology itself. According to senior executives, it is more about a prevailing legacy culture, attitude and mindset.

In tackling the legacy problem and thus assisting organisations to take the big leap towards becoming fully digital, our survey uncovered some valuable pointers to a successful migration strategy aimed at reducing or even eliminating technology debt. These are detailed in our report and summarised below:

- Adopt a business driven and evolutionary (step by step) rather than revolutionary (big-bang) approach when modernising core systems and associated infrastructures to align with customer needs in the emerging digital economy
- Adjust both the business and supporting IT operating models to progress towards an integrated digital organisation, whilst maintaining strategic control over both these aspects of enterprise architecture
- Tackle each layer of the IT stack by employing open standards, modern tools and techniques, especially those emerging within open cloud environments such as Amazon Web Services (AWS) and Microsoft Azure
- Start to componentise (or 'hollow out') monolithic and heavily customised core systems by employing software packages and public cloud services, thereby simplifying access to valuable corporate data and improving front and back end IT integration
- Consider new strategic IT partners in place of incumbents since new partners can bring innovation and the necessary funding to support complex and lengthy migrations

Overall, our conclusion from the many interviews we conducted is that 'do-nothing' is no longer an option if leading organisations wish to avoid catastrophic melt-down as witnessed in sectors such as Retail and Entertainment.

In conclusion, the survey suggests that it is time for Boards and corporate leaders to control their own destinies in the new digital economy, otherwise they are likely to find their destinies in the hands of someone else. As an insurance executive stated 'we don't want to be Ubered out of existence'.

THE REPORT ON ESCAPING LEGACY

According to the University of Surrey's 2015 survey of industry leaders, digital technologies are recognised as having a highly disruptive effect across virtually all sectors in the UK and elsewhere. Such technologies are transforming the way organisations engage with their customers, as well as the products and services that they are offer. At the same time, most large enterprises admit that legacy systems remain a critical roadblock to successful leadership in the new digital economy; a marketplace that demands real end-to-end digital processes, not just function rich websites. Equally, few companies (around 20% in our survey) have a clear strategy for dealing with this challenge or the necessary internal skills or appropriate external partnerships to tackle their legacy issues.

WHY HAS LEGACY BECOME A CRITICAL ROADBLOCK TO A DIGITAL FUTURE?

A combination of external and internal factors is focusing Board and CIO attention on legacy issues in today's increasingly digital business environment. Although a majority of these factors relate to technical issues (some 50% within our surveyed sample), the overall impact on business performance is of overriding importance to Boards, many of whom are just waking up to the realities of the overhang of 'technology debt' associated with legacy.

Fig.1 – Factors Exposing The Legacy Issue

In this context, the University of Surrey undertook a survey of top executive opinion in 2016 to uncover the facts surrounding legacy, and to identify best practice in solving underlying problems such as ageing systems and infrastructures, lack of standards and systems integration, and poor knowledge of current legacy issues. In this report we summarise why legacy has become a major obstacle to achieving a successful digital future, what are the main characteristics of legacy in today's large enterprise, and how best to overcome this roadblock in the coming months and years. We conclude with a suggested methodology based on best practice that has been compiled from our interviews.

At the external level, organisations recognise that they will need greater agility to cope with growing economic uncertainties, especially as this relates to the new era of digital business. The impact of IT consumerisation, user mobility, social media and the Internet of Things has changed fundamentally the way organisations interact with their customers. They must shift from a product oriented view of the world to one that truly meets customer needs. Equally, it has opened the door to powerful new entrants who threaten market stability and in some cases pose existential threats to incumbents. In all these respects, data has now become the core asset for realizing commercial value.

Given the current pace of technology-led innovation, the University of Surrey anticipates an acceleration in the influence of digital over the coming five years. In this time 5G mobile networks will revolutionise the speed and intimacy of customer interactions, and virtual as well as augmented reality will help enrich the customer experience. Within this new digital context, few traditional systems will be able to cope adequately with demands placed upon them such as straight-through (real-time) transaction processing, as well as an explosion in the quantities of data relating to the 'connection of everything' (home, car, cities and inhabitants).

Internal factors also throw a new spotlight on legacy. Most of the organisations we surveyed recognise that their core applications and infrastructures are ageing and in need of urgent modernisation (within 12 to 24 months). In banking this has been highlighted by notable system failures and greater attention from the regulator. This is not just restricted to ancient custom written systems; it is also a problem with many large package implementations. In addition, front office 'digital' applications (or systems of engagement) require much improved, and frequently real-time, access to customer and product data that is often embedded deep within traditional systems of record, operating in 24-hour batch mode.

Furthermore, cloud services are maturing rapidly and are posing potential disruption to every layer of the IT stack, from basic infrastructure components such as storage and compute power, through to fully fledged business services such as HR and CRM. In all these respects, many IT organisations are occupied primarily with sorting out their basic IT operating models, reducing costs and maintaining their existing systems rather than trialing new digital techniques that give their enterprises competitive advantage.

Legacy is a common issue across all sectors

Over ninety percent of organisations included in our survey recognise that legacy is a 'here-and-now' challenge. This applies equally for public as well as private bodies. However, there are variations:

- Clearing banks remain tied to large scale and often heavily customised transactions systems, many of which are decades old and operating in batch mode
- Insurance companies suffer from many of the same problems as banks, but have more options through a wider choice of packaged software such as rating engines
- Central government is also tied to ageing transaction systems, some dating back to the the 1970s, with limitations on how fast they can meet changes in legislation
- Retailers are facing similar challenges as digital channels proliferate. Such channels need to interact closely with core transaction systems that store customer and product data
- Manufacturers have successfully adopted ERP systems that handle back office functions, manage supply chains and customer records. However, many of these have difficulty coping with front-end digital applications relating to local markets (e.g. digital media)
- Utilities have followed manufacturing with ERP adoption, as well as large scale billing applications that are often customised and difficult to evolve

Despite these variations, the response to legacy at both the Board and IT levels appears to be relatively similar across most sectors. The majority of Boards are reluctant to address this issue due to the lack of a compelling financial case. Equally there is a low tolerance to the risks associated with a 'big-bang' multi-year transformation programme. Most prefer to place emphasis on growth-led IT investments that reside largely at the front-end of the business rather than the back-end.

As well as a lack of support at Board level, IT organisations face other internal challenges in addressing legacy. These often include a lack of knowledge of the extent of the problem, vendor lock-in through multi-year contracts, insufficient skills in-house, and uncertainties about the changing IT landscape. Few have developed strategies to mitigate legacy issues.

INSURANCE SECTOR – JOINING UP THE DOTS

Every major insurance company is focusing today on a fundamental transition from 'product' to 'customer offer'. In a highly connected world, insurance executives recognise that matching insurance offers to a specific customer context will be the key to retaining leadership in an ever more commoditised world. This will require capabilities in digital areas such as Internet of Things (wearables, homes and cars), Data Analytics and Process Automation to provide rapid and flexible responses to individual situations.

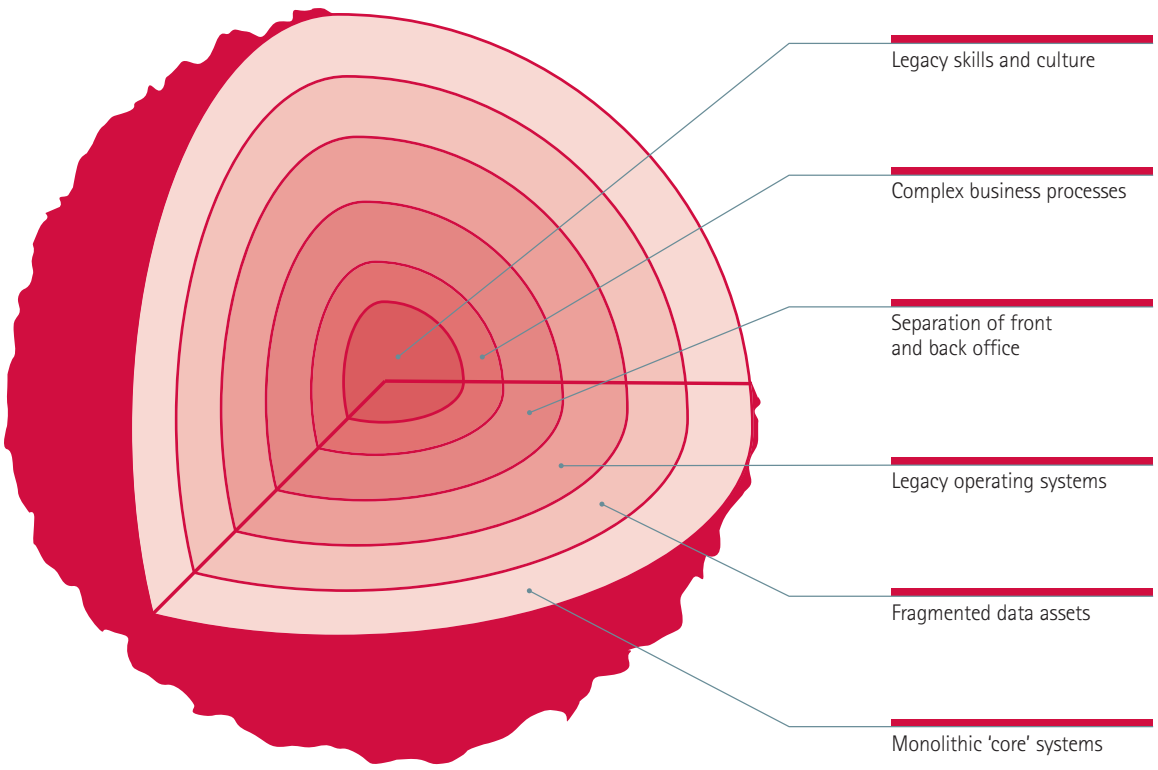
Given that most insurance systems have grown up in a world of acquisitions and mergers, and tight regulation and compliance, unscrambling core legacy transaction engines requires substantial investment and involves significant risk; the issue therefore needs to be high on the company board's agenda. A pragmatic approach is to work at multi-levels of the IT stack, gradually replacing infrastructure, modernising and hollowing out the transaction systems, and supplementing these with packaged software and cloud based services.

Sources: Aviva, Direct Line, eSure, Legal & General, RSA Group.

Digital disruption exposes legacy at each level of the IT stack

The new digital era is highlighting potential weaknesses within current business structures as well as at each layer of the IT stack, especially within core applications (systems of record) and associated infrastructures. Equally, digital is disrupting the IT supply chain itself, prompting the development of different IT operating models for the future. Here is a summary of what characterises the legacy problem within the organisations we interviewed.

Fig.2 – The Characteristics of Legacy



84% of companies now use Cloud; 50% expect to move all their IT estate to the Cloud (UK Cloud Industry Forum 2015 Survey)

Businesses are under increasing pressure to become digital

Digital channels are opening up a new era of customer engagement where information about a transaction can become more valuable than the transaction itself. Data describing customer context, within a store, at home, or in a car, provides the opportunity to customise products to suit each individual's needs. Banks, Online Retailers and Insurance Companies are beginning to reinvent the way they offer credit or underwrite risk based on individual circumstances and associated data.

The explosion in contextual data is still in its infancy and will require massive expansion of storage capacity and processing power to yield valuable customer insights. Cloud platforms such as those provided by Amazon, Microsoft and Google can accommodate such quantum leaps in capability, but need to link into the core transaction systems that contain historic customer and product data.

Organisations themselves remain largely constrained by structures that optimise scale and scope rather than business agility. Despite the rapid onset of digital technologies, few large enterprises are achieving positive outcomes from the deployment of such techniques. Many are beset by rigid organisational silos, legacy systems and lack of investment budgets. Underpinning these issues are complex and often outdated business processes that are unsuited to a fast moving digital marketplace. Perhaps the most important barriers, however, are not the organisational 'hardware' such as systems but softer factors that include skills and culture.

Most organisations recognise that they will need to break apart into smaller units if they wish to compete with more agile newcomers. Companies such as Google have already taken the necessary steps to organise around small product teams that can respond rapidly to market opportunities. This will require fundamental changes to large enterprise culture and leadership skills as well as to the way IT services are configured. Some progressive companies see external partnerships as a means of infusing innovative thinking that can bring about changes in cultural attitudes.

IT ORGANISATIONS MUST ADAPT TO THE NEW BUSINESS ENVIRONMENT

Large IT departments suffer from many of the same structural issues as the organisations that they are designed to support. Many of the applications that have been built up or acquired over the years are reaching the end of their life cycles, leading to increasing cost and business risk. A good minority need to be retired as they are no longer relevant to the business (typically 30-40% of code in the current systems is redundant). At the core, the transaction systems are frequently monolithic in scale and functionality, and resistant to the pace of external changes required of them by digital working.

A more fundamental challenge however is the growing divergence between such systems of record and their counterparts at the front end of any organisation – the systems of engagement. Systems of record typically employ waterfall development techniques and are optimised for stability and efficiency. In contrast, systems of engagement such as online channels and data analytics employ agile development methods and are optimised for speed and adaptability.

The effectiveness of front end systems can often be inhibited by the difficulties encountered in accessing vital data embedded deep within legacy systems. Layers of middleware have been built up over the years to help mitigate such problems. These create additional cost, complexity and rigidity. In addition, the lack of integration between applications, and consequent issues of data quality and cleanliness often lead to unnecessary manual rework that is frequently termed as 'grey IT'.

Infrastructures are becoming outmoded in the face of recent cloud developments

Large scale transaction systems are housed typically in private data centres on mainframe platforms or large, virtualized server farms. Much of this supporting infrastructure (equipment and staff) has been outsourced to strategic partners such as IBM and HP. Such arrangements have offered a stable and relatively efficient solution to historic requirements. However, in recent times the advent of commodity priced compute power and storage in public clouds such as AWS and Azure is transforming the economics and associated partnering model.

In particular, IT organisations recognise that for peak loads and test/development environments, public cloud provides a much more efficient alternative to private, fixed capacity platforms. As outsourcing contracts come up for renewal, CIOs are seeking hybrid cloud solutions that combine public cloud offers with much reduced private data centre footprints. This can halve the cost of infrastructure provision and provide a valuable source of funding for developments further up the IT stack.

BANKING SECTOR – EVOLUTION NOT REVOLUTION

Having struggled over the last few years to emerge from the banking crisis, most established banks continue to focus on improving cost-to-income ratios and reducing operational risk. This has direct relevance to the IT estate, representing some 15-20% of total operating costs. Today, major banks are concerned also about new entrants both from the banking sector itself (such as Metro and PayPal), and also from adjacent sectors such as online retail (BAIDU, Amazon) and digital media (Google, Apple). Further disruptive factors are emerging such as Blockchain that could transform the entire sector.

Many of the core systems remain rooted in general ledger applications dating back to the 1970s and 1980s. Mergers and restructuring have further fragmented the IT landscape leading to high levels of system redundancy and associated cost. Tackling this giant legacy problem remains a central issue for Boards and IT. Many have taken a layered approach, starting with infrastructure modernisation. Banks are now reducing the number and diversity of applications, relying on standardisation, software packages and APIs. Data remains the 'golden' resource in an increasingly digital environment and lies at the heart of modern banking architectures.

Sources: Bank of America, Barclays, Credit Suisse, Deutsche Bank, RBS, Santander

By 2020 public cloud deployments will account for around two-thirds of infrastructure spend (IDC)

One of the critical challenges in exploiting these new cloud offers is the often limited ability of IT organisations to integrate an increasing number of commoditised external services. This requires new internal skills and processes to monitor and optimise cloud services, with the ability to 'plug and play' within a period of months rather than years. Service Integration is rapidly gaining recognition as a critical in-house capability to address the new cloud era, both at the infrastructure and applications Software as a Service (SaaS) levels.

Reaching an acceptable accommodation

All evidence from our survey points to a growing divergence between stable, efficient but generally outdated core systems (the heart of the legacy) and fast evolving front-end digital applications (representing new digital capabilities). This is often referred to as two speed or bi-modal IT. In an ever more agile and responsive business environment, IT organisations have been searching for practical solutions to address this fundamental challenge.

In an ideal world, perhaps by 2020 or beyond, we would expect front and back office systems to converge together into a single, seamless portfolio of integrated applications and cloud based services. In so doing, such an integrated IT platform would offer end-to-end processing that links front end activity to back end resources in a timely and seamless fashion. However, for the majority of organisations that we interviewed, this represents a quantum change to the current IT landscape. Reaching an acceptable accommodation between front and back is in our view at the heart of the current legacy challenge

From our discussions with a wide range of IT organisations, an expedient solution to legacy problems appears to be a combination of top-down and bottom-up adjustments to the entire IT stack, influenced strongly by emerging public cloud services. Here is a summary of our findings:

TACKLING IT LEGACY TO SUPPORT DIGITAL BUSINESS

Fig.3 – Layered Approach To Addressing Legacy

Layer within the IT Stack	Assessment of the 'as-is' legacy	Vision for a future operating model
1. Infrastructure	Strategic lock-in to traditional vendors (IBM, HP)	Hybrid or public cloud (AWS, Google and Azure)
2. Data layer	Fragmentation of data assets (embedded)	Common data assets available to all apps through common warehouse
3. Back Office 'Core' applications	Monolithic, outdated core (e.g. customised)	Integrated suite of SaaS and software packages
4. Front Office 'Digital' applications	Detached from core IT architecture	Open platform shared with all applications
5. Business Services	Bespoke, complex processes	Simplified and standardised processes

Infrastructure refresh offers a pragmatic starting point for legacy replacement

As current outsourcing contracts reach termination, IT organisations are starting to migrate to hybrid cloud solutions with beneficial impact on cost efficiency and operational flexibility. In areas such as compute and storage, attractive new cloud partnerships are available through Amazon (AWS), Microsoft (Azure), ORACLE and Google Cloud. These offer a variety of standardised or proprietary Platform as a Service (PaaS) environments, equipped with an ever growing number of open source tools for application development and data management.

The challenge is to combine these commoditised and flexible public cloud platforms with existing private infrastructure assets such as data centres and networks. The transition to a web-based working environment at the device level is helping to ease this transition. However, most organisations recognise that they need to develop a separate, in-house, service integration layer to manage a hybrid cloud environment effectively. This requires new skills, methods and tools that are in relatively short supply.

One clear benefit of adopting the hybrid cloud path is the attractive economic returns that it can offer. Savings of between 20-40% are possible, providing much needed funds to tackle legacy issues further up the stack.

Core legacy applications require a more evolutionary approach

As discussed earlier, large scale transaction systems frequently lie at the heart of today's legacy problems. These may originate from large scale, bespoke developments, as is the case for most financial service, retail and central government organisations, or the early adoption of monolithic ERP systems in the manufacturing, and utility sectors. In both cases, organisations are seeking to rationalize the number of systems they run and progressively replace functionality with packaged software or cloud based SaaS offers to improve agility and reduce costs. They are also making use of tools such as those from Modern Systems and Blue Age to modernize or even re-architect these systems. Ultimately, many CIOs believe that the core system can be re-platformed or replaced entirely once it is reduced to a manageable size (what many referred to as a 'hollowing out' process).

As the landscape for packaged software and cloud services increases, this option will become ever more compelling. However, the real prize will be to access vital commercial data more transparently. This will require a full migration of the data embedded within legacy core systems into an open environment so that it can be accessed easily both by digital channels and data analytic tools. Public cloud is providing powerful new data storage and management techniques that improve data quality and accessibility.

FULL INTEGRATION BETWEEN FRONT AND BACK OFFICE IS THE DESIRED END GOAL

As adoption of cloud services and modern software packages at each layer of the IT stack progresses, the main goal will be to bridge the current gap between back office systems of record and front office systems of engagement. This will require componentisation and standardisation of IT assets at each level, delivering a more agile and better connected platform on which business processes and structures can be simplified and streamlined.

A growing number of integration tools are becoming available, together with standard APIs, which reduce the need for middleware and associated costs and complexities. Again, modern cloud platforms contain many of the necessary capabilities to achieve this end goal. The path to a more open, integrated environment can be evolutionary rather than revolutionary, thus avoiding the risks associated with a big-bang approach that frequently fails to deliver the forecast economic return.

The largest gains will be at the business level

Our survey suggests that the Boards of largest organisations recognise the problems but appear apathetic in resolving them. At the IT level, only 20% of the organisations surveyed claim to have a process in place to address their legacy issues. This corresponds broadly to the absence of concrete plans higher up at the business level. In contrast, digital competitors such as Google have created a modern environment in which to launch new products and services with relative ease. The gap between twentieth century industrial organisations and new digital incumbents has never been wider.

The wholesale modernisation of IT platforms will not solve these problems on its own. However, flexible and well connected applications can enable rapid and beneficial changes in organisational structures and supporting processes. Equally, the selective adoption of cloud based business services can eliminate a growing part of the IT estate in areas such as finance, HR, CRM and supply chain management. The new cloud era is opening up entirely new structural options that lead to agility and scalability without the traditional constraints of bespoke systems that are hard to adapt and costly to maintain.

Our survey reveals that full convergence of back and front end systems is possible today with the adoption of modern tools. Such integrated architectures offer far greater optionality for business leaders in the new digital era. They also help to ward off new entrants who can take full advantage of these methods from day one.

However, technology cannot be seen to be the sole answer to the problem. Businesses must pursue simplification of their business

Replacing legacy technologies is one of the 3 top business objectives driving investment in Cloud (UK Cloud Industry Forum 2015 Survey)

Modernising core business applications is a top five priority for IT departments (Gartner 2015)

processes and rationalization of their product portfolios. There is clear evidence that simpler business models supporting fewer products are not only cheaper to operate but also more agile. They will be better placed to exploit digital technologies, tools and techniques and make best use of the growing range of cloud services.

Further work is needed to embrace a digital future

Despite the enticing prospects of digital technologies, much work remains to clear the path for a digital future. From our CIO level discussions, several challenges need to be dealt with at the IT level:

- Talent building to introduce digital skills into the organisation, commensurate with digital ambitions
- Introduction of standards at every layer of the IT stack to encourage seamless interworking within and external to the organisation
- Incumbent suppliers helping solve these issues rather than protect their revenue
- Clear strategies to address legacy issues with a compelling business case for IT investments
- A roadmap that adopts a progressive and evolutionary path towards a modern IT platform, based on agile rather than waterfall development methods

We also found a number of obstacles that need addressing at the business level:

- Provision of investment to address the legacy systems
- Upskilling of Boards in IT and digital skills
- Adoption of customer centricity throughout organisations
- Making long-term decisions when the tenure of CEOs and senior executives is typically 3-5 years

Although many of the executives we spoke to were confident about how they could address such challenges, doubts remain as to the viability of traditional, twentieth century business structures. Some organisations are choosing to partner with digital newcomers to explore alternative business models. In a few cases, Boards have sanctioned 'green-field' start-ups to help transform market position. The most enlightened recognise that scale and scope will continue to be an unassailable advantage, but the means of deployment will need to change to meet the new digital realities.

MANUFACTURING – SOFTWARE IS THE NEW RUST

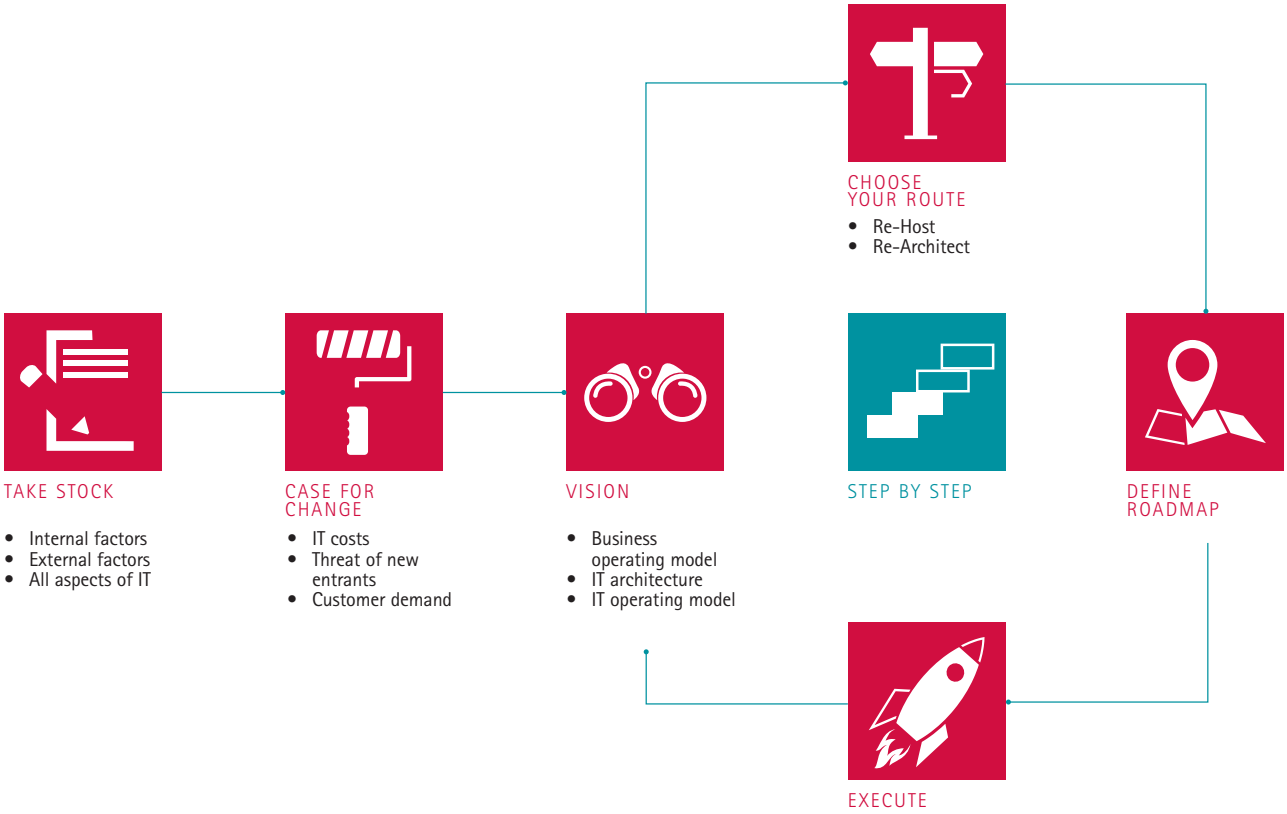
Connectivity is transforming the functionality of consumer products in such diverse areas as e-cigarettes, healthcare appliances, white goods and cars. This opens up entirely new possibilities for in-life product enhancements, and related value-added services. Vendors are challenged to exploit vast new sources of data relating to the way their products are used, and the need to provide constant software updates, e.g. mobile apps. At the same time, manufacturers are under pressure to reduce production costs by adopting standard systems and processes across the globe. Such trends impact both on the core systems of record that control the manufacturing processes, and systems of engagement that encompass sales and product support.

Most core manufacturing systems fall into one of two categories – SAP or ORACLE. Such systems tend to be monolithic, combining a full range of functions within one applications suite. The rapid growth of SaaS services such as finance (Oracle), CRM (Salesforce), HR (Workday) and collaboration (Google Apps) is encouraging IT organisations to reduce the scope of the core by supplementing it with cloud offerings. At the front end, organisations are partnering with agile development houses to exploit embedded software within the product itself. In the longer term, many such manufacturers will rely almost exclusively on third parties for the majority of production tasks, thus becoming characterised as software companies.

Sources: Aggregate Industries, BAT, Ford Motor Company, Reckitt Benckiser

OUR METHODOLOGY – 'EVOLUTION NOT REVOLUTION'

Fig.4 – Methodology – Evolution not Revolution



Despite the growing pressures to modernise legacy systems, our conclusion from the survey is that escaping legacy should be an evolutionary rather than revolutionary journey. Most of the organisations we spoke to recognise that such a modernisation journey requires a sustained and programmatic effort over a number of years, addressing all levels of the IT stack, from infrastructure at the lowest layer, to business process redesign at the highest level. This implies a combined IT and business change programme that is underpinned by a robust joint business case where 'do nothing' is no longer an option.

The challenge for many IT organisations is to construct a compelling case for change that delivers tangible business benefits. In turn, this requires a receptive Board that has a full grasp of the digital economy and is looking to restructuring its operations, front to back. Sadly, many senior executives appear to respond to legacy only when major service failures occur.

Developing a clear strategy and roadmap

Much as this may be a familiar story, we see no substitute for a clear strategy and roadmap to address the legacy issues. This should include:

- A comprehensive Current State Assessment that encompasses every layer of the IT stack, from infrastructure and applications to key business processes and associated data. It should also evaluate internal skilling and external partnerships. This assessment should not be considered a one-off exercise, but one that builds a comprehensive and maintainable knowledge base
- An End State Vision for the business and associated IT platform that encompasses developments in devices (such as Internet of Things), digital processes and public cloud services (such as SaaS). Emphasis should be placed on retaining internally only the specific business processes and supporting IT systems that truly deliver market differentiation. The rest should be externalised
- A step-by-step Roadmap that delivers incremental benefits over time whilst progressing to the end state vision. Advantage should be taken of 'trigger' events such as contract terminations and end-of-life support that will necessitate changes being made across the IT platform. Equally, new business initiatives such as a product or service launch or even an acquisition may provide an ideal staging post for new IT architectures and partnerships

One point that reoccurred in our conversations is the need for flexibility at all stages. The speed of change at both the business and technical levels implies a constant re-evaluation of the end state as well as the necessary steps to refine the roadmap. Focussing on the 'next stage architecture' seemed to resonate with leading practitioners.

Addressing the entire IT stack in a systematic fashion

According to the 40 organisations interviewed in the survey, the most practical and compelling approach to the legacy problem is to address each layer of the IT stack in a systematic and progressive manner. We summarise here some of the key actions required to modernise the stack:

- At the infrastructure layer, organisations should exploit the growing availability of commodity public cloud services Infrastructure as a Service (IaaS) such as Amazon Web Services and Miscrosoft Azure by substituting traditional outsourcing contracts with hybrid cloud solutions
- For 'systems of record', monolithic and ageing applications should be componentised (or 'hollowed-out') where possible to allow progressive replacement with standard software packages and public cloud services (SaaS). The remaining core should be converted or re-architected onto a modern platform or, if necessary, re-written entirely and decommissioning systems that are no longer needed should not be forgotten
- For 'systems of engagement', a platform should be adopted underpinned by common standards, open APIs and modern integration tools such as Integration Platform as a Service (iPaaS), to encourage seamless communication across applications at both the front and back end of the organisation. Organisations can then build their own front-end applications or adopt those provided by growing developer communities
- At the data layer, fragmented data assets frequently embedded within legacy applications should be brought together into a central repository based on a clear set of data standards that enables simple and universal access. Powerful tools are emerging here such as Data as a Service (DaaS) within public cloud environments
- Business processes should be streamlined and standardised as greater use is made of standard software packages and public cloud (SaaS) services. Data integration will help to eliminate costly re-work across the information supply chain. The ultimate goal will be end-to-end digital working

From our discussions with many leading organisations, we discovered a variety of different approaches to legacy modernisation. However, a common theme is beginning to emerge. Some leading practitioners recognise that public cloud platforms such as Amazon Web Services and Miscrosoft Azure can offer a comprehensive set of tools to tackle challenges at every layer of the IT stack, from infrastructure and data through to applications and business services.

IT SECTOR – CLOUDED BY UNCERTAINTY

Since 2010 the sector has been thrown off balance by the combination of IT consumerisation and accelerating public cloud service adoption. Prior to this time, IT vendors could rely on traditional revenues such as outsourcing, large scale application developments, and sales of software licenses. These sources are now in gradual decline. Customers today remain partially pre-occupied with reducing the cost of core systems and infrastructures, but recognise that new digital applications and channels represent an urgent priority to which vendors need to respond.

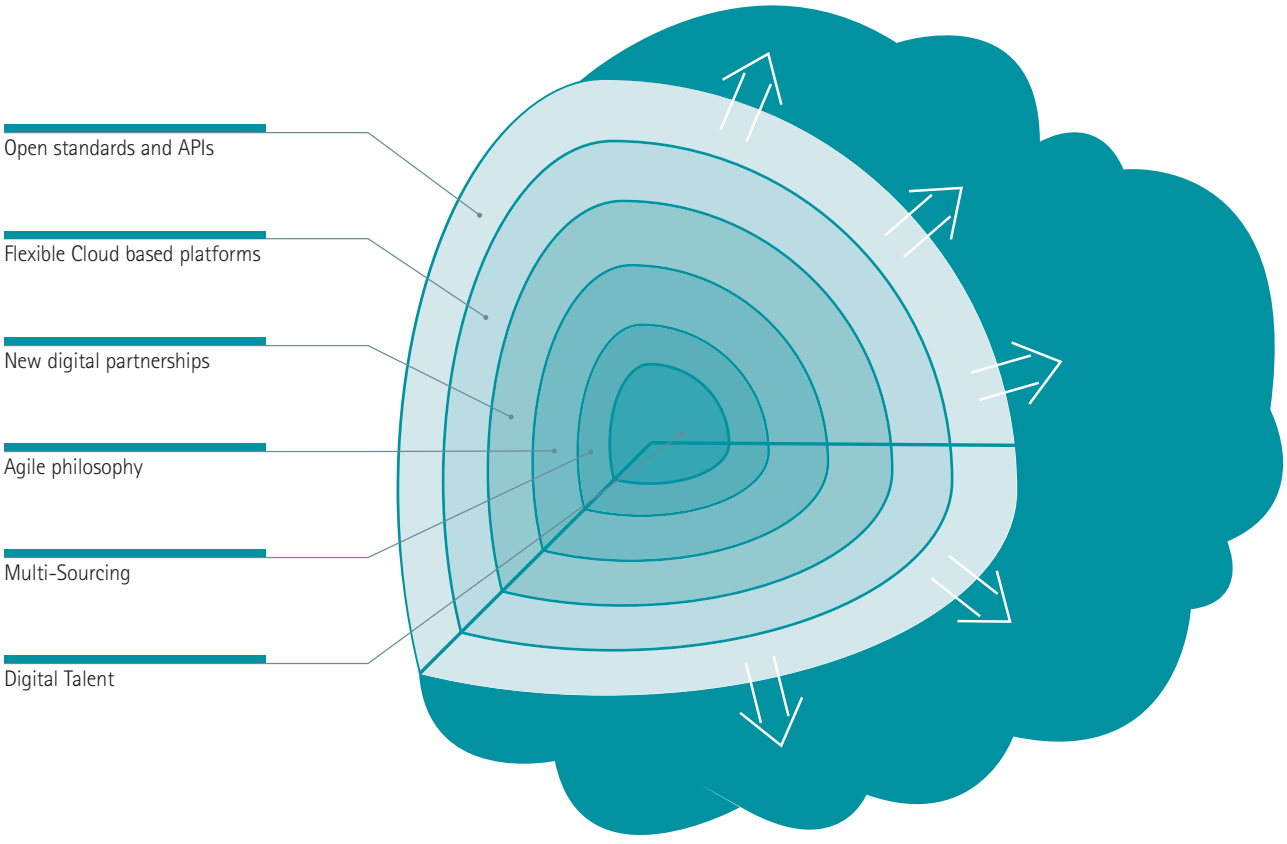
Leading software houses such as SAP, Microsoft and Oracle have moved at different speeds to adjust to the new digital realities. Microsoft has virtually re-invented itself with a wholesale move to public cloud (Azure) and related office and collaboration products. Oracle has been struggling to integrate its own legacy systems such as JD Edwards, PeopleSoft and Siebel into a coherent open cloud offering. SAP is pursuing HANA as a means of promoting data analytic techniques to its universal customer base. All recognise that the future will be based on standard packages, public cloud services and componentized architectures.

Sources: Accenture, ATOS, HP, IBM, Microsoft, ORACLE and SAP

TOWARDS A 'NEXT STAGE' DIGITAL ARCHITECTURE

As we progress towards the digital economy, the nature of business is certain to change in ways that are difficult to predict today. Levels of connectivity will accelerate through developments in areas such as the Internet of Things and fifth generation mobile (likely to come into service in 3-4 years). Our task at the IT level is to enable such changes rather than to impose unnecessary barriers on our business partners. Now is the time for CIOs to adopt a new IT operating model that can serve business well into 2020 and beyond.

Fig.5 – New IT Operating Model



PUBLIC SECTOR – CONSTRAINED BY MONEY AND POLITICS

The public sector is operating in a world of budget cuts and changing political agendas both of which constrain their ability to address their legacy systems. Central Government, alongside the biggest banks, has arguably the most challenging legacy situation due to the unique nature of their systems for which there are no application packages that can replace them. In contrast approximately 80% of local government needs are met either by standard back office packages such as Oracle or specialist local government packages. The public sector has also embraced digital through the advent of Gov.uk and the development of a number of new digital services. However, few of these services are yet to deliver fundamental change in terms of self-service for citizens.

For central government escaping legacy inevitably means some significant custom development effort to replace those systems where major policy or business change is required; others can be modernized through use of code and database conversion tools. For local government there is a flourishing market in packages although the need to better integrate their public services could create some integration challenges across these packages. The public sector is taking a custom build approach to its front end services underpinned by a platform approach to delivering common services.

Sources: DWP, HMRC, Local Government – Warwickshire, Leeds, Solihull and One Source

Our survey suggests that the tools are now available to implement new flexible IT operating models that can serve a digital business in a flexible and responsive manner. The characteristics of such a model include:

- Support for any future business operating model that will be needed to compete successfully in the emerging digital environment
- Ability to accommodate rapid technological change that is predicted over the next 5-10 years in areas such as devices, digital channels and machine learning
- Designed to exploit new external partnerships with cloud providers and agile software developers as well as innovative new start-ups
- Capable of embracing a more flexible multi-sourced model at each layer of the IT stack to exploit changes in the rapidly evolving external IT services landscape
- Ensuring that software design and development adopts an 'engineering discipline' to deliver both reliability and flexibility, thus minimising future legacy issues

Enacting such a model will require a set of internal skills and capabilities that are frequently missing in legacy organisations. Most crucially the need to retain control over architecture, security, standards and vendor management will require an uptake of expertise that is becoming hard to find in the developing battle for digital talent. Many CIOs now regard talent development as a critical success factor for their IT organisations and are focusing on broadening their supplier base, expanding graduate recruitment and adopting apprentice schemes.

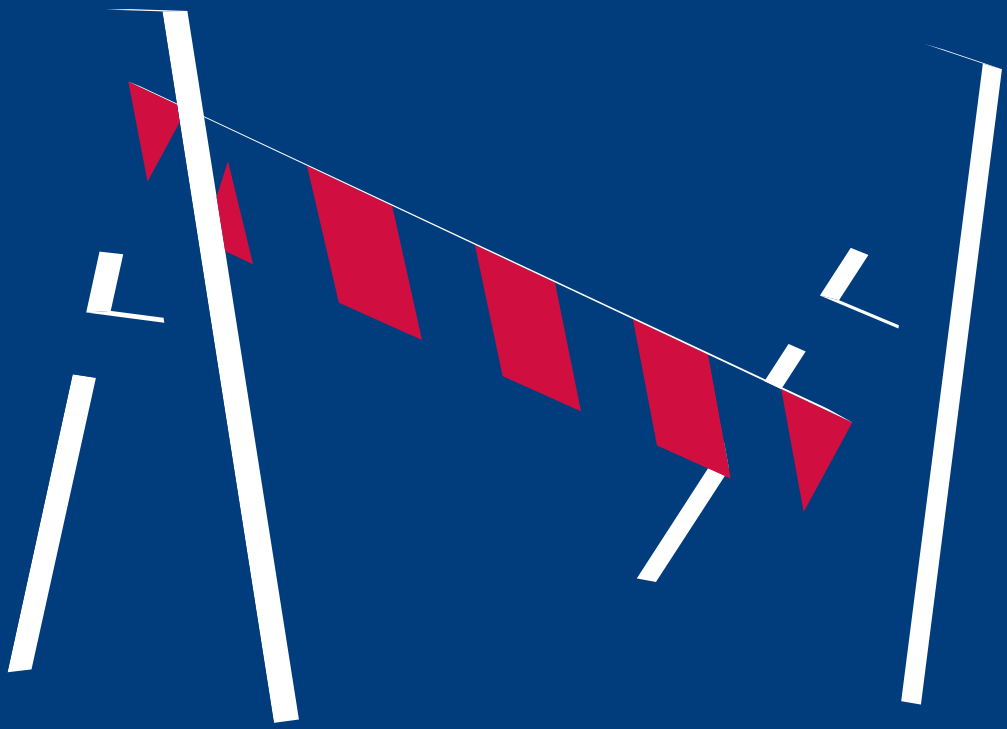
PREPARING FOR THE NEW DIGITAL ECONOMY

The transition to a fully digital business may be the largest step that organisations have undertaken in several decades. However, the speed at which new entrants can disrupt a market sector indicates that action is needed now to remove obstacles such as ageing core systems and infrastructures.

One of the most critical aspects of launching a major change programme such as legacy replacement is to have the Board fully engaged in this undertaking. One of the most significant findings of our study is that the majority of Boards do not yet understand the importance of such a step. Nor do they feel the sense of urgency associated with such a fundamental move forward. Our advice to CIOs and their external partners is to accelerate awareness and discussion around legacy issues to clear the way for a modernisation journey.

Two activities that will support Board awareness and associated engagement is a thorough assessment of the current IT situation against the both the external and internal factors identified earlier in this report, and a clear business case that argues the tangible benefits of addressing legacy. According to our survey only 20% of leading organisations have developed a comprehensive 'case for action' relating to legacy. This will be a pre-requisite to gain Board level support. Such a case will need to link business goals and objectives to the current IT situation (i.e. a gap analysis), and propose how such goals can be met (i.e. a future IT vision based on digital business).

As we have stated in this report, the 'do-nothing' option is no longer viable. All the evidence suggests that now is the time to act given the growing maturity of new options such as hybrid and public cloud services. We hope that this report will carry some authority in acting as a catalyst for change, and the University of Surrey will be happy to share more detailed findings on request.



About the University

The University of Surrey was voted 'University of the Year' in 2016 by The Sunday Times and The Times, and has one of the UK's top ten business schools. It has recently established the Surrey 'Centre for the Digital Economy' (CoDE) that brings together world class research into 5G mobile, Internet of Things, Cyber Security, Business Platforms and Agile Development. CoDE has become a vital bridge between academia and business, large and small, to harness the commercial power of innovation and to make management education more relevant to the needs of the digital economy.

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