Data Governance in the Software Lifecycle

Assuring the security of sensitive information

Martin Atherton, Jon Collins and Dale Vile, May 2008

Many organisations have been driving improvements in information management to gain better control over their information assets. While things in this area are not perfect, awareness of the challenges is now high and action is being taken to enhance capability in the areas of compliance, discovery and, not least, data security. But are all the bases adequately covered?

KEY FINDINGS

Despite higher level initiatives, some important activity is falling under the radar

When feedback was gathered from 240 IT and business professionals on the topic of information governance, it was clear that an important area of activity is frequently overlooked. More than 70% of organisations employ data from live systems during the software development lifecycle for testing purposes. Unlike operational areas of the business that are subject to corporate level guidance and scrutiny, however, information governance in this pre-production environment is left largely to IT.

The risks are significant, and understanding them is important

While those running IT departments and development projects are generally very responsible, the environment is actually more risky than it appears at first sight. The people involved in software development and testing are not always employees, activity is often highly distributed across multiple locations, and the IT landscape used to support the development and test cycle is not always separated from live systems. With the best will in the world, there is inherently a lot of scope for things to go wrong, so effective information governance is critical to assuring ongoing security.

Plugging process and automation gaps is key if risks are to be properly managed

The way in which test data is managed is frequently highlighted as an area for improvement, which points directly to process deficiencies in many organisations. Even where processes are in reasonable shape, though, exposures still exist. The majority of respondents in the research alluded to the need for improvements in automation in areas such as test data management, live data sanitisation, and workflow management during the testing process. This suggests a high degree of reliance on manual procedures, which by definition will be prone to error.

Proactive review of current policy and process is recommended in many cases

If you are responsible for running an IT department or development organisation and haven't yet been challenged on how live data is used during the software lifecycle, it's only matter of time before this happens so it is better to prepare proactively. Rather than thinking of this as a burden, however, there is a real opportunity here to secure the support and funding required for making improvements that will deliver much broader benefits. Whether it is more efficient process or investment in better tools to manage software testing, the result is likely to be a smoother and more efficient operation that is both more pleasant to work in and to manage. From the corporate perspective, however, we cannot lose sight of the real imperative for control, which is effective risk management and preventing that accident which is sitting there waiting to happen.

The research upon which this report is based was designed and interpreted on an independent basis by Freeform Dynamics. Feedback was gathered from 240 IT and business professionals during the study, which was sponsored by IBM.

Introduction

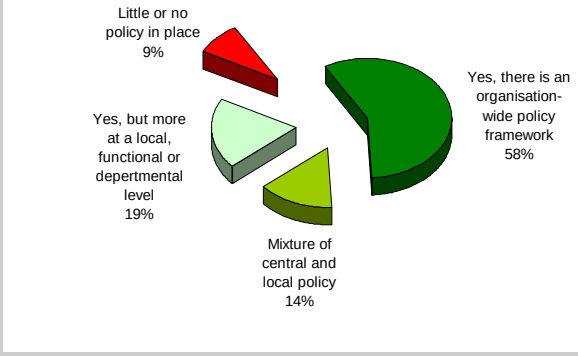
This report is based on the findings of a research study completed in May 2008 to determine how data is used in the software development and testing process, what weaknesses exist, and how these weaknesses can be treated. The study involved in-depth telephone interviews with 240 business and IT decision makers in the three key European economies of France, Germany and the UK. For further information on the research sample please refer to Appendix A.

Background and context

Improving the way business and IT strategy is implemented and executed throughout an organisation in a consistent manner has been a constant topic for discussion since 'governance' became an industry buzzword several years ago. In practical terms, nowhere has this been more important than in improving the way in which business information is treated from an operational, security and overall risk and compliance perspective.

Against this background, previous research [1] has shown that forward-thinking organisations are driving towards implementing information management capabilities to assist them in gaining better control over their information assets. While this is by no means a challenge that every organisation has overcome successfully yet, it is fair to say that most are aware of the limited control they do have and are starting to take action. Information governance, including security and access, is therefore an item that is high on most corporate and IT agendas today.

When we look at the practicalities in this area, one of the considerations is scope of policy, and at first sight, while there is evidence of policy fragmentation in some cases, most tell us that governance frameworks are in place at one level or another (Figure 1).



It has become common for information use and access policy to be defined centrally, underlining how seriously this area is being taken.

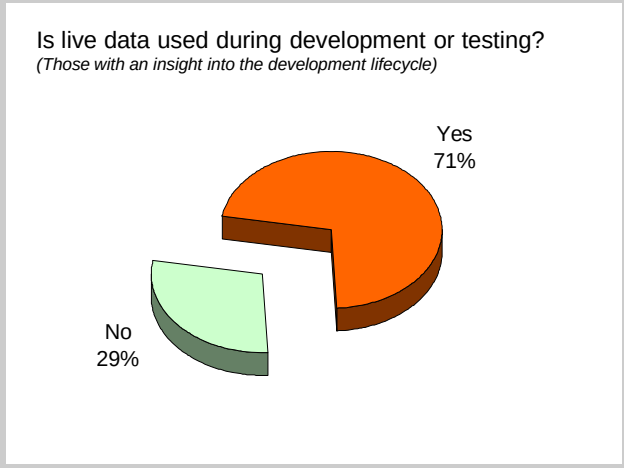
Figure 1

The presence of such policy is clearly important, as it is hard to expect people to treat information appropriately and consistently if they are not given the necessary guidance. Where there is a reliance purely on locally defined policy, however, or when certain areas within the organisation fall outside of 'company-wide' frameworks because they don't immediately seem relevant when considering requirements from an information policy and risk perspective, exposure can occur. This sets the scene for the core theme of this report, which is information governance within the software development lifecycle.

Spotlight on software development

Software development is an area that does not always come under as much scrutiny as elsewhere concerning information management and risk. This is understandable as pre-deployment activities taking place here are somewhat 'hidden from view' in an operational sense, and because there is seemingly little to worry about until a project enters the operational side of the business by 'going live'.

However, the fact that over 70% of those with an insight into the development lifecycle tell us they are using live data in their testing environments suggests a need for many of us to think again about some of our prior assumptions in this area (Figure 2).



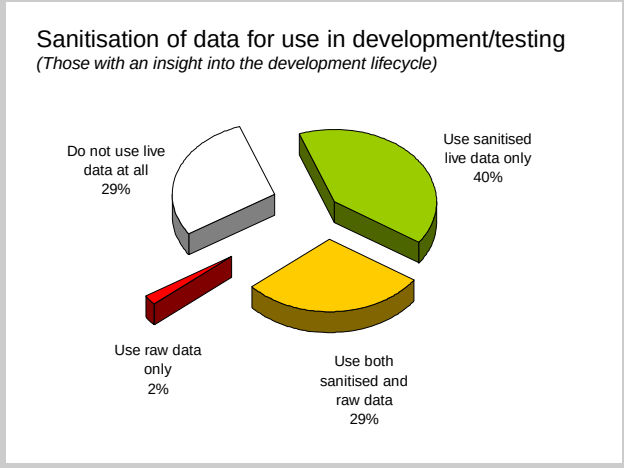
Of the respondents with an insight into the development lifecycle, the majority indicated use of live data during software testing.

Figure 2

The use of live data in this way should not come as a surprise, however. During the research, respondents highlighted a range of reasons to explain why it is often necessary to use data extracts from live systems during the development and testing process. In order of importance, these were:

1. We need data in sufficient quantity to model workloads and performance levels accurately
2. It would not be possible to replicate the live environment without using real data
3. We cannot fulfil our testing obligations without demonstrating success with real data
4. Use of live data saves us a lot of work creating test data from scratch
5. Live data ensures that specific situations are modelled accurately in the data

In terms of data preparation and control, while many take steps to 'sanitise' or 'anonymise' live data before use in development and testing, about a third of respondents indicated use of data straight out of live systems in raw form (Figure 3).

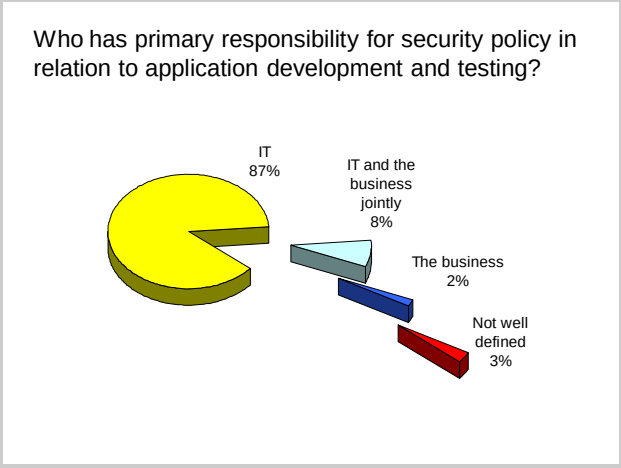


Just under a third of respondents indicated use of data straight out of live systems in raw form, with another 40% routinely sanitising data before use.

Figure 3

Now before we get carried away with the notion that some IT departments are being reckless by using live raw data in this way, they are not necessarily taking risks, as it will depend very much on the data in question. The use of live data will only become an issue if the act of using it contravenes internal or external (industry) guidelines, or creates opportunities for theft or loss.

This, and indeed the question of how the sanitisation of live data takes place from a procedural perspective, brings us to the question of how data security in particular is managed within IT. When we look at this, we find that the IT function is largely left to itself when it comes to defining and implementing security policy in the development and test environment (Figure 4).



The IT function is largely left to figure out and implement its own security policies in relation to application development and testing.

Figure 4

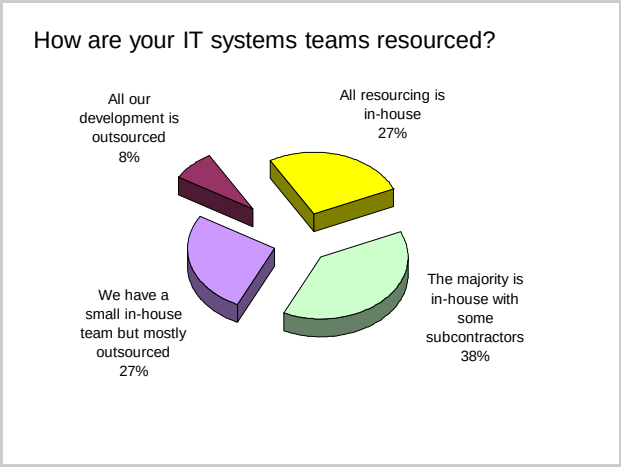
Some would argue that this in itself is a cause for concern given that there is a business risk associated with using live data in any context, so accountability is important. Beyond accountability, however, there are also other factors which need to be considered when assessing the overall risk.

Understanding the risks

There are a number of areas specific to the software development cycle which contribute towards the risk of information governance related policies and standards being breached:

- Who is involved in software development and testing?
- How is testing activity spread geographically?
- How well separated are test and live environments?

When it comes to resourcing IT teams, it is clear that consideration must be given to external as well as internal staff (Figure 5).

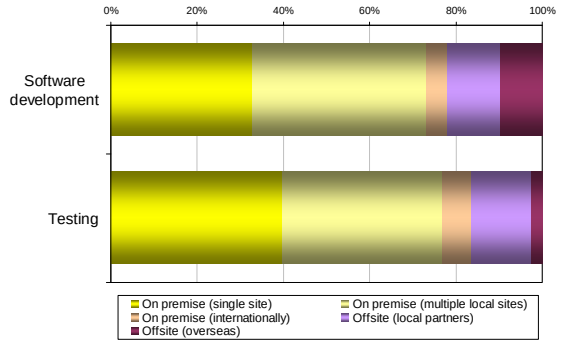


The majority of IT teams in modern business are comprised of a mixture of internal and external staff.

Figure 5

The physical location and distribution of development and testing activity adds another interesting dimension to the consideration of lifecycle security (Figure 6), especially if a project leader has less control over the policies and procedures employed outside their own physical location.

Where does the majority of systems development and testing take place?

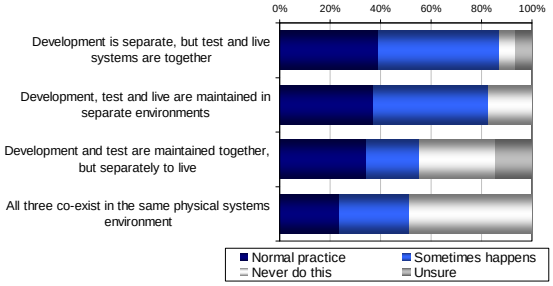


Software development is a cross discipline, cross firewall and sometimes even a cross continental affair.

Figure 6

Then there is the question of how much development, test and live environments are separated during the lifecycle. Overall, while around 50% of organisations never mix live and test environments, there is a fair degree of mixing going on in the other 50% (Figure 7).

Considering implementing new systems or significant upgrades to existing systems, how usual is it for you to set up development, test and live environments in the following ways?

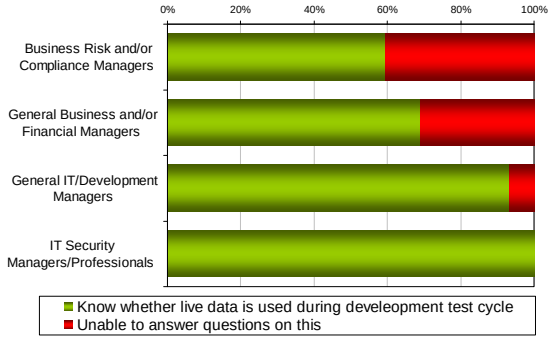


There is no hard and fast rule as to how live and test environments are treated – and it can vary from project to project.

Figure 7

And highlighting the issue of visibility and accountability, it is telling how often those responsible for overall business risk and/or compliance are not even aware of the fact that live data is used in the testing environment, let alone how it is being managed and access controlled (Figure 8).

Knowledge of whether test data is used during the development or test cycle



Business respondents are far less likely to know when live data is used in development or test, than IT respondents.

Figure 8

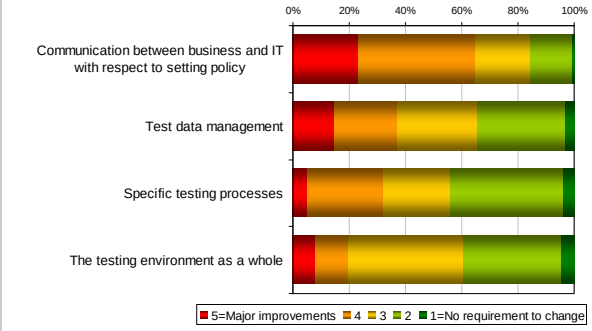
So, what we see is a situation in which IT departments could be in the position of having to use live data in the development lifecycle, while controlling access by both internal and external staff, with project teams spread across multiple sites, working on development and test systems that may or may not be co-located with live systems. Even if only one or two of these risk factors apply in any given instance, the scope for mistakes and oversights alone, without even considering deliberate or malicious breaches, creates a significant potential exposure from a data security perspective. And yet IT is rarely challenged on how this exposure is managed.

So how real is this risk?

To determine the extent of the problem we can look at the level of confidence that exists in how things are currently controlled, paying particular attention to where the need for improvement is highlighted.

Assessing the level of exposure

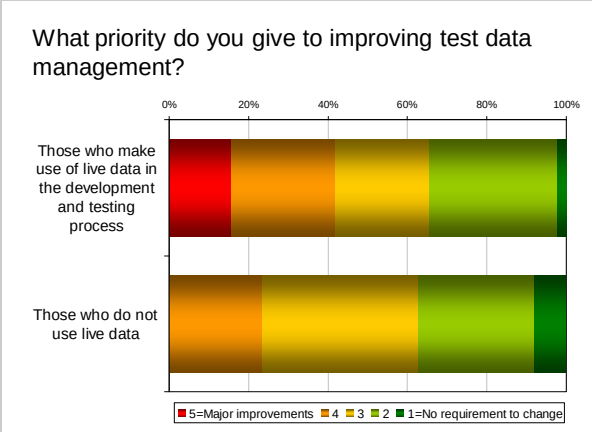
Focusing in on improvements that organisations seek in their testing environments, we can see two very interesting 'headline' findings. The majority of organisations see communication between IT and the business as a major area for improvement, and also acknowledge that their test data management needs improving (Figure 9).



The overall testing environment is certainly not seen as perfect, but it is the areas of test data management and communication between business and IT which give most cause for concern.

Figure 9

For a clearer indication of the dangers that have arisen in some organisations, we can consider how the responses stack up between organisations that are using live data in development and testing, compared to those who are not (Figure 10).

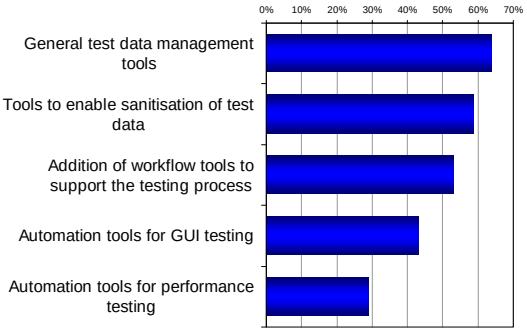


Those organisations using live data in their test environments are more sensitive to the need for improving their test data management capabilities – this is an appropriate reflection of awareness.

Figure 10

It is those with 'more to lose' (i.e. those using live data) that acknowledge the need for most improvement. This is no doubt in part due to a heightened awareness of the issues surrounding the appropriate use and protection of live data. However, if an organisation uses live data in its testing activities and considers that it should make significant improvements to its testing in general and improving the management of test data specifically, this would suggest current provisions are inadequate, i.e. highlights a significant real exposure from a process perspective.

Beyond the adequacy of processes, we have the question of technical capability, and it is really quite telling that improvements in some pretty fundamental areas are highlighted, most notably tools support in relation to general test data management (Figure 11).



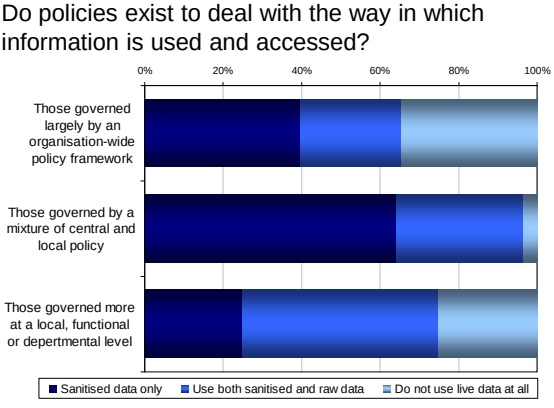
There is strong acknowledgement that the testing environment can benefit from improvements in technical capabilities

Figure 11

Also noteworthy are the gaps highlighted in relation to tools to assist with test data sanitisation and the management of workflow during testing. This overall picture, in fact, suggests that IT departments are generally underserved in terms of automation, which in turn means a heavy reliance on error-prone manual procedures.

Managing the risks

Of course one way of managing the information related risk in the software development lifecycle is to cease using data from live systems. As we have seen, however, live data extracts are used for very good reasons. In fact this is to be encouraged as part of testing best practice to ensure that system performance and behaviour is assessed running against information that mimics the real world as much as possible. With this in mind, it is interesting to see that organisations where good local policy and process is implemented in conjunction with higher level frameworks appear to be making broader and safer use of live data for testing (Figure 12).



A combination of central and local policy guidance drives up the safest way of using live data.

Figure 12

This picture makes absolute sense, as a combination of central and local policy provides the flexibility required to deal with the needs of individual projects, while preserving the principle of accountability. A big advantage with this approach is that decisions may be taken on an informed basis at a local level, rather than leaving things to some distant, central body that may apply corporate policy blindly and create unnecessary constraints.

In contrast to this, as we can see, where corporate frameworks predominate and local controls are absent or weak, IT departments can sometimes be inhibited from taking advantage of live extracts, which is not in the best interests of the organisation. At the other extreme, where activity is governed purely by local policy, the picture is very mixed, and the outcome less predictable.

However the above picture is interpreted, though, the lesson is that one of the ways in which the information related risk in the development and test cycle can be mitigated is by ensuring that the policies and processes used to control things in the IT department are consistent with, and supportive of, any broader information governance framework that is already in place. This means IT management understanding the higher level objectives and imperatives as they relate to information risk, but also making sure that those in the business with responsibility for information related governance and compliance have an awareness and appreciation of how live data is used pre-production.

At the next level down, drilling into what goes on in the development process itself, indications are that improved testing processes also reduce the risk, as measured by the amount of data sanitisation carried out. This is consistent with other findings suggesting that organisations using sanitised live data during testing (the optimum situation) are more likely to have a single set of testing processes that are stringently applied.

The lesson here is to make sure procedures are documented and enforced at the appropriate level of detail to cover how live information is used and managed during the development process. While doing this, particular attention needs to be paid to how the sensitivity of data from live extracts is assessed (live data is sensitive, some is not) and therefore when sanitisation needs to take place before data is make accessible to developers and testers. An implicit part of this is dealing with the question of who is responsible for ensuring proper sanitisation when necessary and how such sanitisation is carried out and checked for effectiveness.

This brings us to the last major imperative from a risk management perspective, which is to minimise the reliance on error prone manual processes wherever possible, and given the nature of the automation gap we have seen, the importance of this should not be underestimated. If development staff themselves are responsible for sanitisation using relatively crude techniques such as tracking down sensitive data in databases and ‘blanking’ it using interactive SQL or ad hoc developed scripts, then things will be overlooked and security exposures will result. Use of appropriate tooling for defining, planning and executing the sanitisation process in a structured and automated manner will reduce the risks considerably, as will broader test data management and workflow solutions that lead to more visibility and predictability.

In a companion paper [2], we provide a number of more detailed actionable guidelines. These start with building an understanding of what information is in use in test and development, then move forward from there.

Conclusion

Over the past decade, we have seen a sea change in how risk is considered. Organisations have moved from thinking about data security to information governance. However good we get, there will always be room for improvement: after all, this is about a journey, not a destination. Equally, there will always be more to do: as risks are better understood and mitigated, new areas of risk are uncovered.

One such area concerns how data is used in software development and testing. From this study we have seen a number of factors conspiring to create unnecessary levels of risk, not only in how the IT department shoulders the responsibility, with little business input, but also the fundamental challenges of how applications are tested and made ready for live deployment.

The question of whether or not there are specific problems associated with using live data extracts in the test environment does not generate a black and white answer. It is a highly subjective area, but the research findings suggest that there is significant scope for mis-hap, and therefore an opportunity for improvement and risk mitigation.

To deal with the risks, there are a number of points to consider, and a number of areas that any organisation may be keen to explore. These include aspects such as policy, process and tooling, all of which need to be considered as a whole in order to respond to the risks that clearly exist.

As a final comment, addressing this space has highlighted that using live data in a test environment might not automatically mean danger. However, for legislative as well as general security reasons, organisations would be wise to ensure they know exactly where they stand. Ignorance is not an option.

References

[1] “Information Governance: The keystone of a sustainable business and IT strategy“, Martin Atherton and Jon Collins, February 2008

[2] “Data Governance in Software Testing: A best practice primer”, Jon Collins, May 2008

Appendix A

RESEARCH SAMPLE

The research sample was comprised of 240 respondents, distributed as shown in the figures below.

Participants by Role

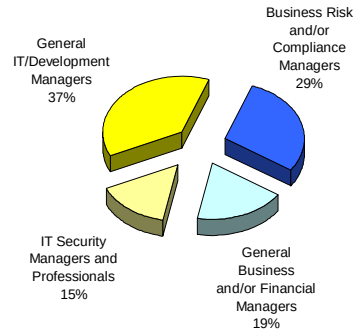


Figure 13

Participants by Organisation Size

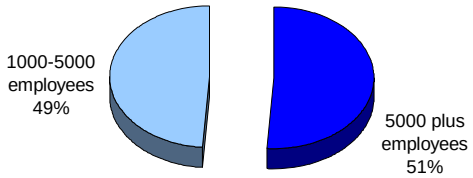


Figure 14

Participants by Country

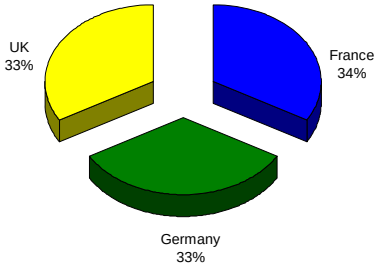


Figure 15

Participants by Industry Sector

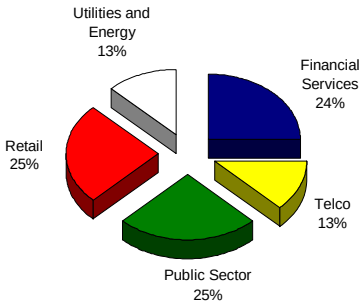


Figure 16

About Freeform Dynamics

Freeform Dynamics is a research and analysis firm. We track and report on the business impact of developments in the IT and communications sectors.

As part of this, we use an innovative research methodology to gather feedback directly from those involved in ITC strategy, planning, procurement and implementation. Our output is therefore grounded in real-world practicality for use by mainstream IT professionals.

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