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# Evolution of x86 Server Estates

## Modernisation drivers and practicalities

Dale Vile and Jon Collins, Freeform Dynamics Ltd, November 2009

*Justifying the purchase of x86 servers to run new applications has never appeared a real issue for most organisations. Indeed, as costs have come down for ever more powerful kit, the server procurement habit has often led to the accumulation of large x86 estates made up of multiple generations of equipment. But as these estates have grown over time, have they kept up with the real demands of the business from a service delivery perspective? And with this question in mind, what is the case for investment in modernisation of the x86 environment?*

### **KEY FINDINGS**

#### **Businesses are dependent on x86 servers running Windows and Linux**

Feedback gathered during a recent survey of almost a thousand IT professionals confirmed it is typical for larger organisations to be running many hundreds, if not thousands, of Windows and/or Linux x86 servers, with even smaller entities often above the ten server level. Running workloads ranging from database management, through application and web serving, to security services, there is no doubt that the x86 server is now very much part of the IT and business fabric.

#### **Yet performance of x86 estates can leave a lot to be desired in many cases**

During our research, four key performance indicators (KPIs) were considered - quality of service, time to benefit for new capability, risk management, and operational efficiency. For every indicator, while some organisations are achieving great success, a similar number are failing to deliver acceptably, with those in the middle having room for improvement to one degree or another.

#### **At a detailed level, a number of specific drivers for change and evolution exist**

Apart from improving overall performance, a number of more specific drivers of change and evolution are evident. From a business perspective, these are mostly to do with supporting the dynamic nature of the modern business environment, dealing with data growth, supporting new or changing application functionality, etc – i.e. the main imperative is to allow more to be done. From a technical and operational perspective, virtualisation stands out as being the most prominent agent of change.

#### **Single dimensional views of modernisation can lead to missed opportunity**

Those with older x86 estates tend to perform significantly less well, as do organisations with big gaps in their monitoring and management capability. When looking to drive improvements, however, it is worth bearing in mind that modern equipment is inherently more manageable and capable of supporting virtualised environments, as well as providing greater operational visibility. Dealing with either hardware upgrade or operational improvement alone therefore means opportunities will be missed and return on investment will not be maximised.

#### **A joined-up service-centric approach is recommended**

When reviewing current capability and looking at modernisation options, there is value in taking a holistic approach with the overall objective of creating an efficient, flexible and well managed virtualised environment. Defining the problem in terms of overall service delivery will help to make sure that infrastructure modernisation is acknowledged as a legitimate part of the business agenda.

*The study upon which this report is based was independently designed and executed by Freeform Dynamics and performed in collaboration with The Register news and information site. Feedback was gathered via an online survey of 979 IT professionals from the UK, USA, and other geographies. The study was sponsored by Intel.*



## Introduction

One of the biggest transformations that has taken place in IT over the past 15 years has been the opening up of server computing through the widespread adoption of x86 servers. As part of this phenomenon, we have seen commoditisation of many aspects of the server environment, and the consequential lowering of equipment costs. Indeed today, servers based on the x86 architecture are delivering price performance that could only be dreamt of back in the early 90s.

But it's not just in the areas of performance and economy that we have seen the x86 platform develop. Modern servers are more reliable, more power efficient, run cooler, and incorporate facilities that allow remote monitoring and management to be implemented much more effectively. With the emergence of virtualisation technologies, the x86 server environments of today also allow increased utilisation of equipment, while at the same time delivering increased flexibility.

In business terms, such developments should, in theory, allow IT departments to deliver a better service to business users at a lower cost. This is a hypothesis we will be exploring within this report to help those working on plans and business cases for upgrades and modernisation of x86 estates to decide where to put the emphasis.

Given that costs and quality of service are also both impacted by how well the server environment is monitored and managed, however, we will also be looking at the operational dimension to provide a rounded view of investment and return.

## Inputs into this report

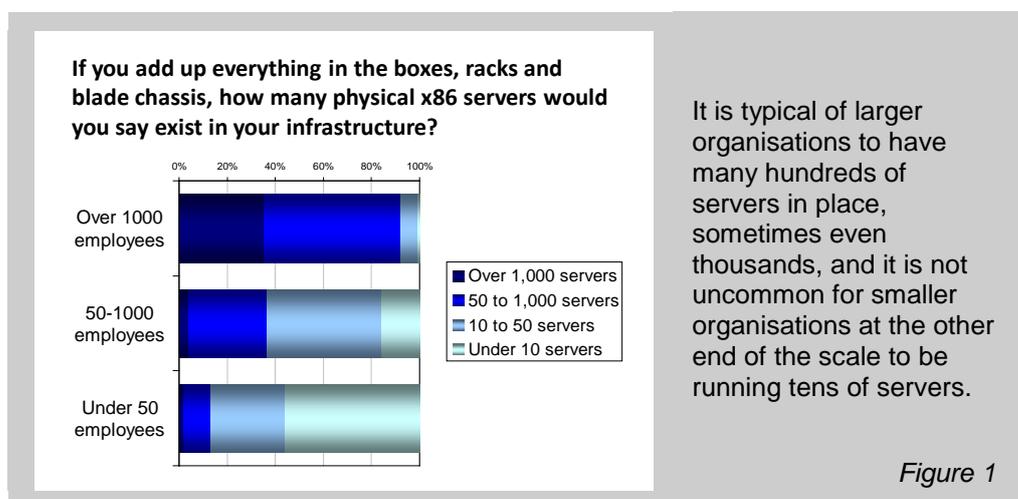
As a foundation for our discussion we'll be using input gathered via a research study completed in October 2009, during which feedback was gathered from 979 respondents via an online survey.

Those who participated in the study were mostly IT professionals from a range of organisation sizes and industries, with representation predominantly from the UK and USA, and a number of respondents from other geographies (see Appendix for more details).

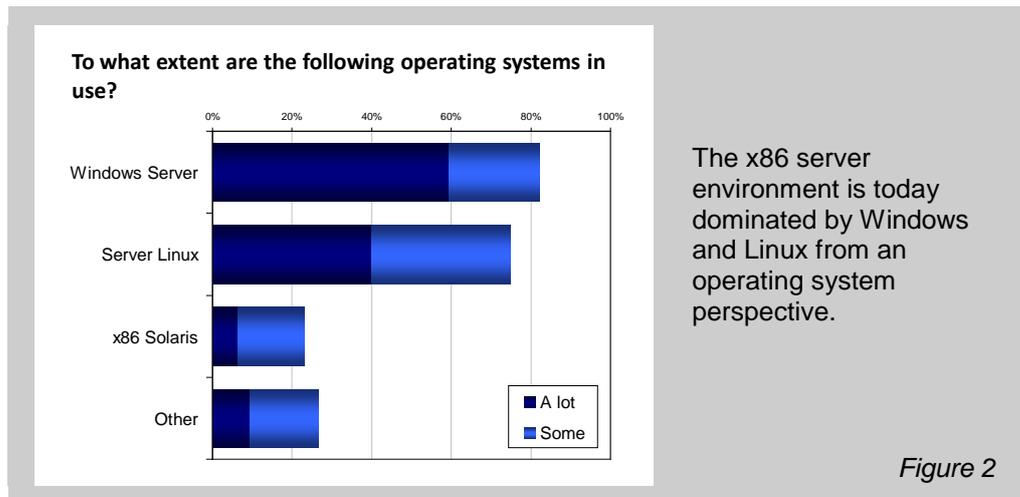
The study was designed and executed on an independent basis by Freeform Dynamics Ltd ([www.freeformdynamics.com](http://www.freeformdynamics.com)) and conducted in association with *The Register* news and information site ([www.theregister.com](http://www.theregister.com)). The work was sponsored by Intel.

## x86 servers are part of the computing fabric

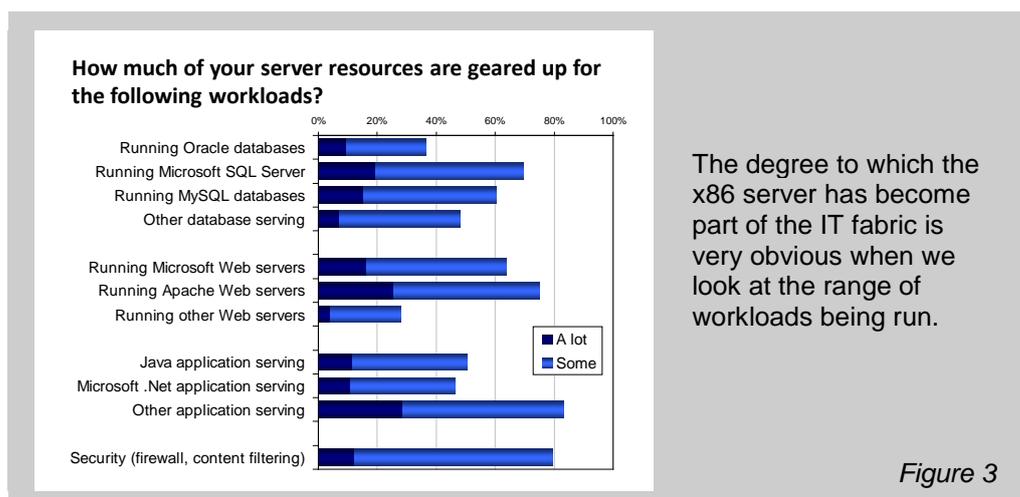
To begin with, it is worth reminding ourselves just how pervasive x86 servers have become. At one end of the spectrum, it is typical of larger organisations to have many hundreds of servers in place, sometimes even thousands, and it is not uncommon for smaller organisations at the other end of the scale to be running tens of servers (Figure 1).



From a software platform perspective, while x86 servers are extremely versatile in what they can support, the reality is that the environment today is dominated by two operating systems, namely Microsoft Windows and Linux as the open source alternative (Figure 2).



When we look at what systems are used for, the degree to which the x86 server has become part of the IT fabric becomes very obvious. Examples of almost every kind of workload can be found, ranging from database management, through application and web serving, to the running of security services such as firewalls, content filtering, and so on (Figure 3).



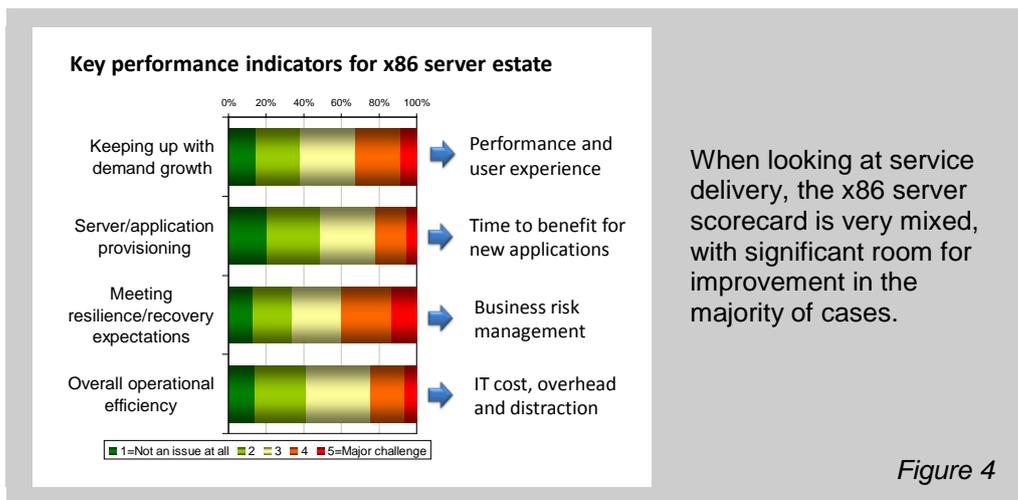
Gone are the days when x86 servers were confined to the file and print domain and small-scale departmental systems. While the role of the platform for general-purpose computing will continue, today there are many examples of very large scale systems running on this kind of architecture. Indeed, at the extreme end of the equation, some of the most powerful setups in the high-performance computing (HPC) world are x86-based, such as Linux and Windows clusters to deal with parallel processing of compute intensive workloads, and even some mainframes.

Given that the x86 estate is now such an integral part of the IT and business landscape, an important question to consider for any organisation is how well it is delivering.

## The x86 scorecard

A number of key performance indicators (KPIs) can be used for assessing the performance of an x86 estate. During our research, we considered four such indicators to do with physical performance and user experience, time to benefit for new application functionality, business risk management, and the

important question of costs and overhead. When capabilities relating to these are explored, the resulting scorecard is very mixed (Figure 4).

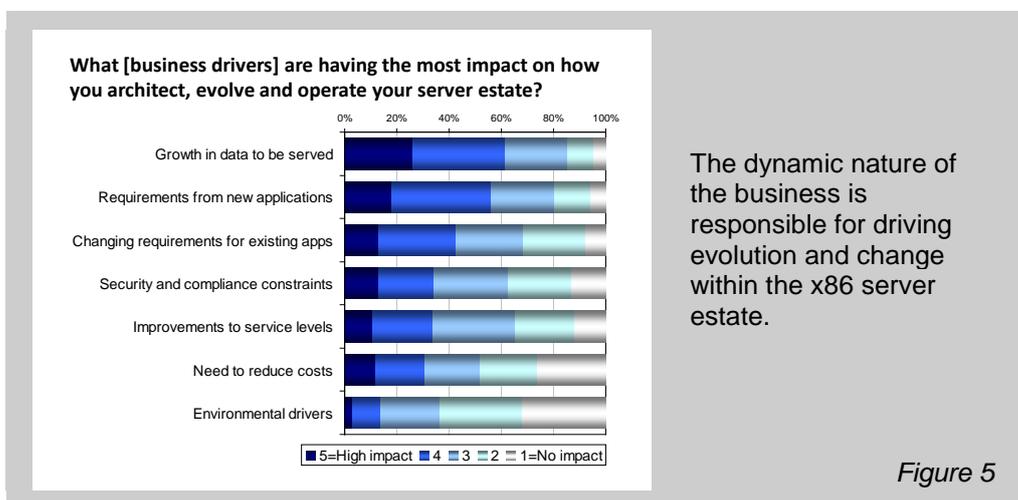


For every indicator, while some organisations are achieving great success, just as many are failing to deliver, with those in the middle clearly having room for improvement to one degree or another.

We will be looking at some of the factors affecting these KPIs a little later in this report, with a view to understanding the importance of certain types of investment and modernisation activity. Before getting into this, however, it is worth taking a step back and reviewing some of the more specific drivers for change.

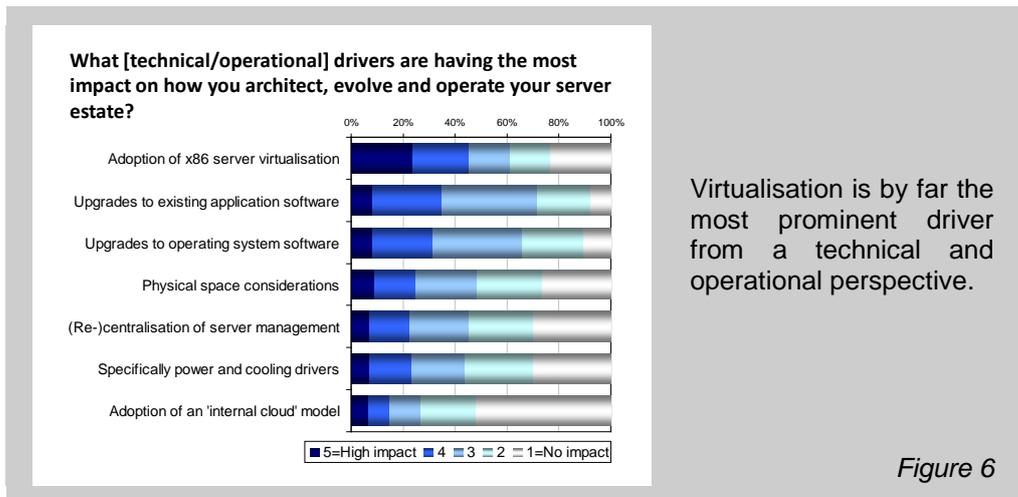
## Drivers for change and evolution

Drivers for change can be considered in two main categories. Firstly, we have business drivers, and when we look at the relative strength of these, it is clear that the dynamic nature of the modern business environment is responsible for most activity (Figure 5).



The drivers we see at the top of the list are mostly to with increasing demand in one way or another. Whether it is the need to manage more data and therefore throughput, or to support new or changing application functionality, the big imperative is to allow more to be done. It is also interesting to note that cost reduction, while highlighted by many, is in itself not a big driver of activity in the majority of cases. That's not to say it isn't a factor in decision-making - organisations will always keep an eye on costs - it's just that it is typically a secondary rather than primary consideration as getting the job done takes precedent. For those concerned about the planet, however, it will be disappointing to see the environment figuring so low on the scale, with fewer than one in ten regarding it as important.

The second category of driver is to do with the technical and operational domain, and the first observation here is the prominence of virtualisation, with almost half of respondents considering it to be important to them, i.e. giving it a rating of 4 or 5 on the impact scale (Figure 6).



We can also see from this picture that software related drivers, which go hand in hand with the previously seen need for new and changing functionality, come next on the list, although the relatively low impact rating here suggests it's primarily a business push rather than an IT pull.

In contrast to the relatively low importance of the green/environmental driver we saw from a business perspective, the related issues of space, power and cooling are rated more highly in this operational view, highlighting that rightly or wrongly, parochial costs and physical constraints tend to trump concerns for the greater good. Not surprisingly, it's still early days for more dynamic 'cloud type' architectures to have an impact – an area in which IT vendors are still way ahead of their customers.

While priorities and imperatives will obviously vary between organisations, it is clear from the above that quite a few factors are driving change and expansion with x86 estates. But is there a case for modernisation in general rather than just continuing to add servers as demand increases?

## The importance of proactive modernisation

When we look at the status of the x86 server environments out there, we see a mix of installations when viewed from a currency (age and spec) perspective (Figure 7).

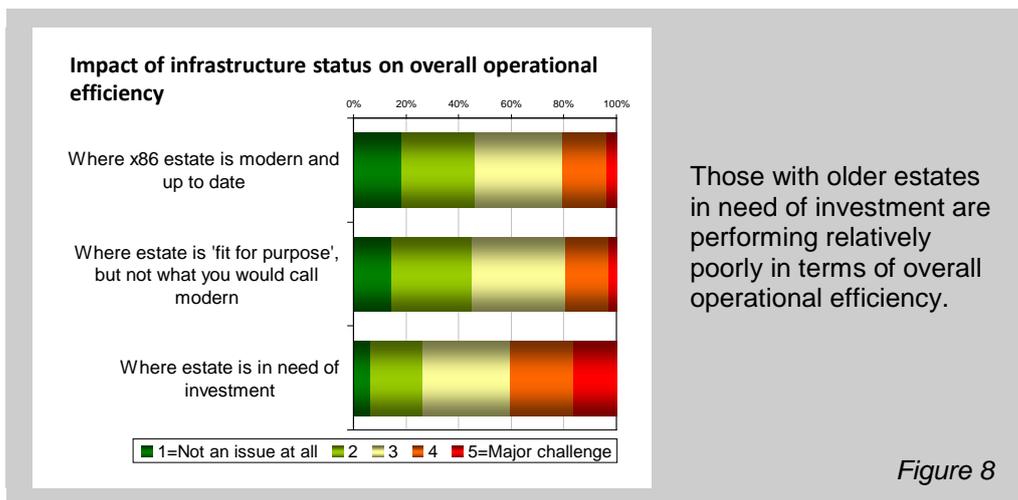


At first glance, things don't look too bad. A sizeable group (37%) considers their server estate to be modern and up-to-date, with a similar size group (40%) saying their estate might not be modern, but

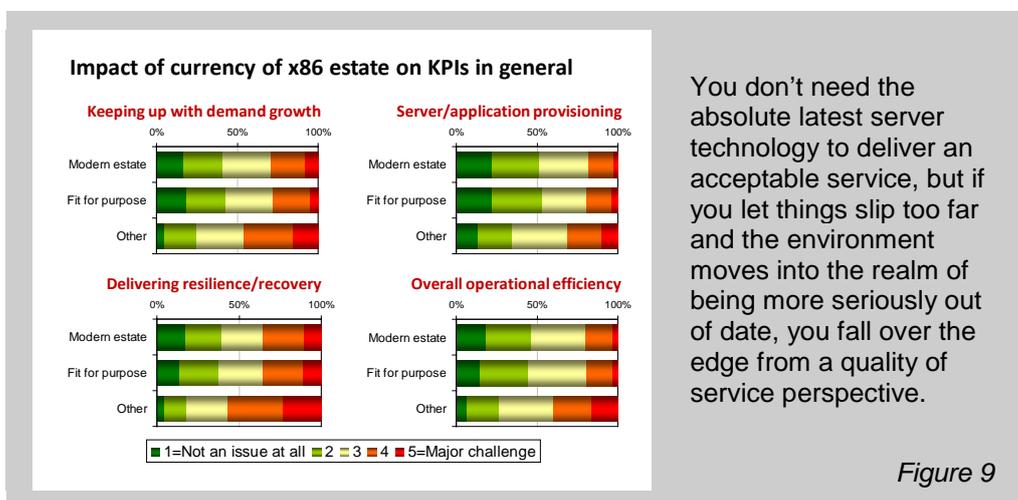
is stable and fit for purpose, at least for the time being. That's four out of five respondents apparently indicating the 'acceptability' of their current equipment in terms of age and spec.

It is important to remind ourselves, however, of the scorecard we saw previously (Figure 4), which clearly didn't paint as rosy a picture. With this in mind, we can conclude that a modern infrastructure isn't in itself enough to guarantee effective service delivery (more of that later) – but does it have an impact at all?

The indications are that it certainly does. If we focus on the cost/overhead KPI, for example, as measured by operational efficiency, we can see that those with older estates in need of investment are performing relatively poorly (Figure 8).



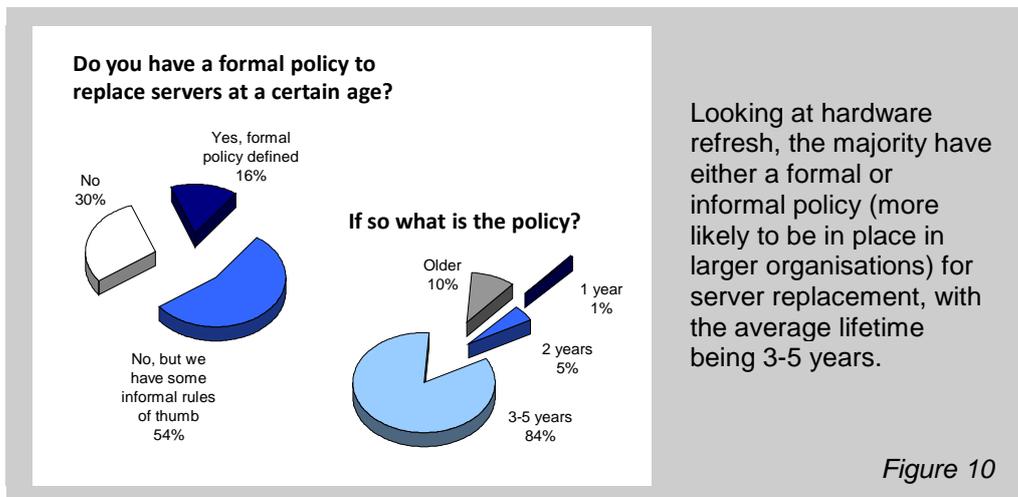
And in fact, we see a similar picture for all of the four KPIs we have been considering (Figure 9).



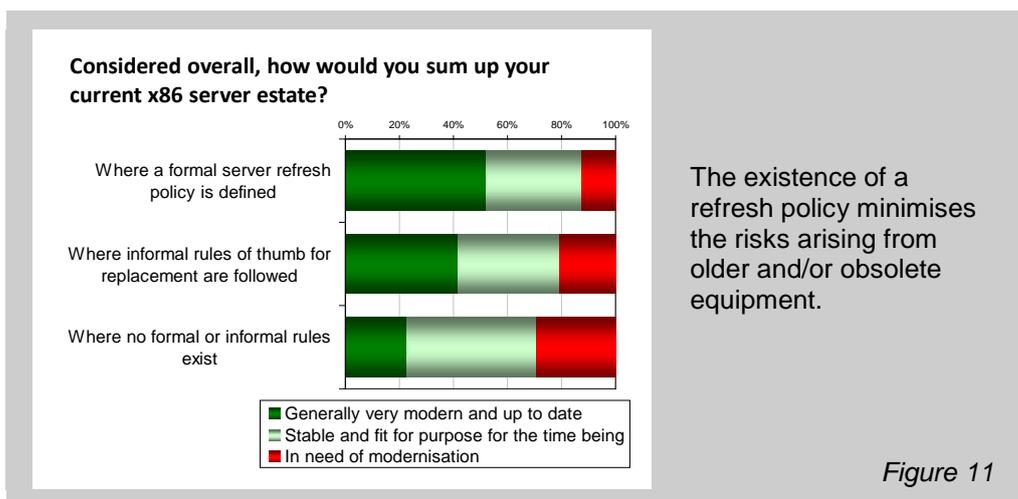
What's notable here is that the analysis reveals little difference in performance between those with a modern and up-to-date infrastructure, and those with an ageing infrastructure but that is still fit for purpose. This tells us that you don't need the absolute latest server technology to deliver an acceptable service, but if you let things slip too far and the environment moves into the realm of being more seriously out of date, you fall over the edge from a quality of service perspective, at which point there is significantly more chance of a tangible negative impact on both IT and the business.

Keeping the server estate current can therefore be considered a question of business risk management and, as with all forms of risk, the exposure of the business is minimised if you handle it

proactively. Rather than let equipment age to the point of becoming a problem in terms of manageability, reliability, upgradability, software compatibility, and so on, it is far better to pre-empt such issues by implementing some kind of hardware refresh policy (Figure 10).



While the existence of such a policy is not a guarantee in itself of infrastructure currency, it does significantly reduce the risks arising from older and/or obsolete equipment (Figure 11).



So, to summarise our analysis so far, we have determined that keeping the equipment within our x86 server estate in as good a shape as possible from a modernisation perspective, while no guarantee of good service delivery, certainly stacks the odds in our favour. The question then becomes what else has an impact on the service levels delivered.

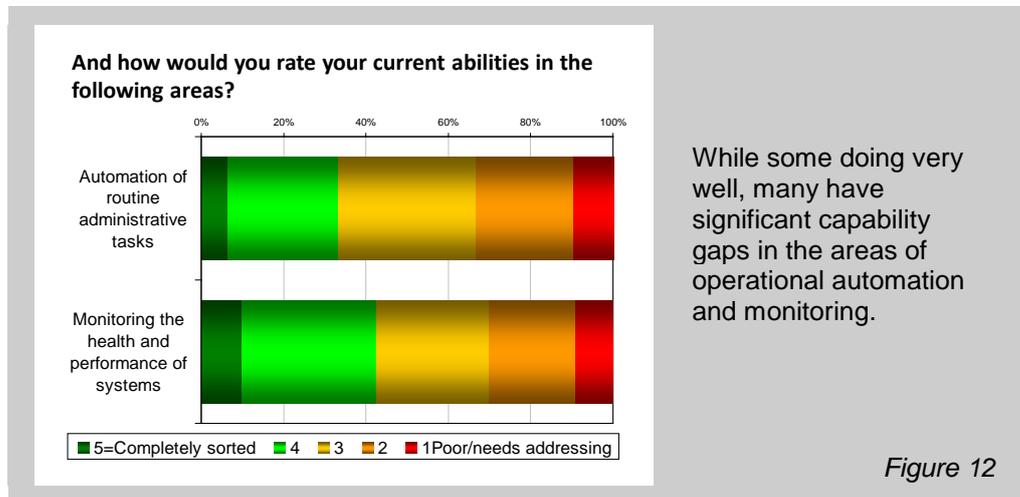
## The importance of effective operations

During the research, those participating in the study were asked to provide some feedback on a range of factors likely to affect the way in which IT services are delivered and received. As part of this, we were particularly interested in a couple of important areas.

The first of these is the degree to which routine administrative tasks can be automated, as we know from general experience that this can help to minimise mistakes and inconsistencies arising from manual activity, which in turn can help to keep the infrastructure stable and optimised. On an ongoing basis, the monitoring of system health and performance is also a key mechanism for making sure the infrastructure is operating as it should and that potential issues are identified and dealt with pre-

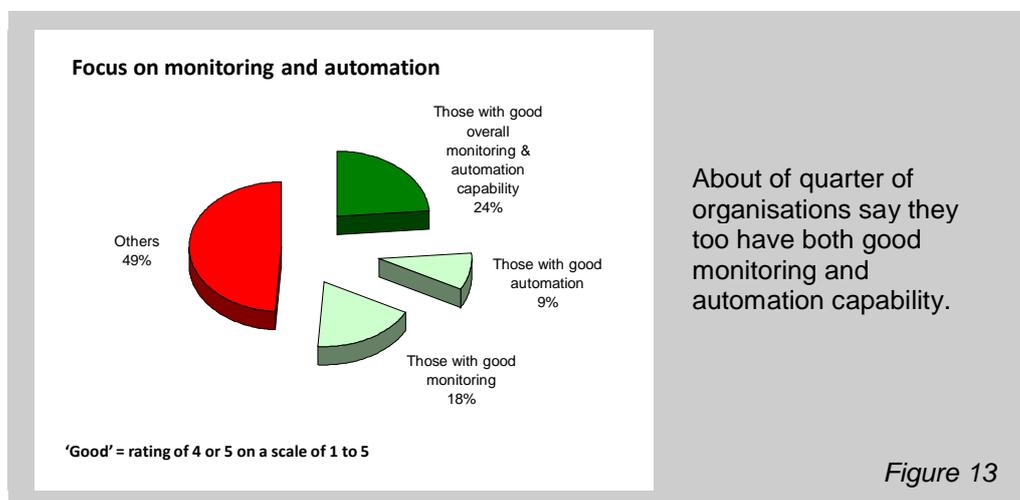
emptively. The principle of prevention typically being much less costly than cure is very much relevant in this context.

When we look at such capabilities, as with some of the earlier analyses, we again see a very mixed picture, with some organisations performing really well, others very poorly, but most having room for improvement to one degree or another (Figure 12).



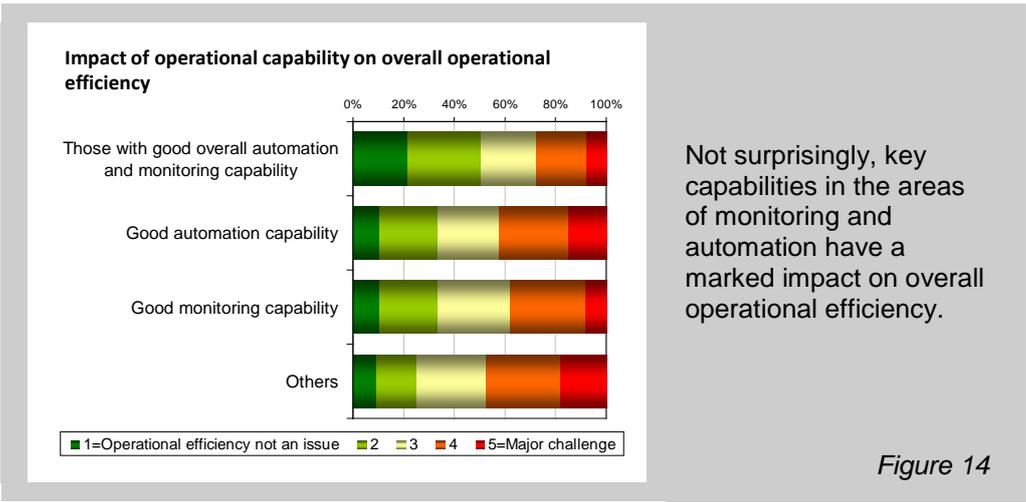
In order to explore the impact capability gaps in these areas, we used the responses to group respondents into a series of segments, and in doing so regarded those rating themselves with a 4 or a 5 as having 'good' capability in the relevant category.

Using this approach, about a quarter of the sample fell into that elite group of organisations saying they have both good monitoring and automation capability (Figure 13).



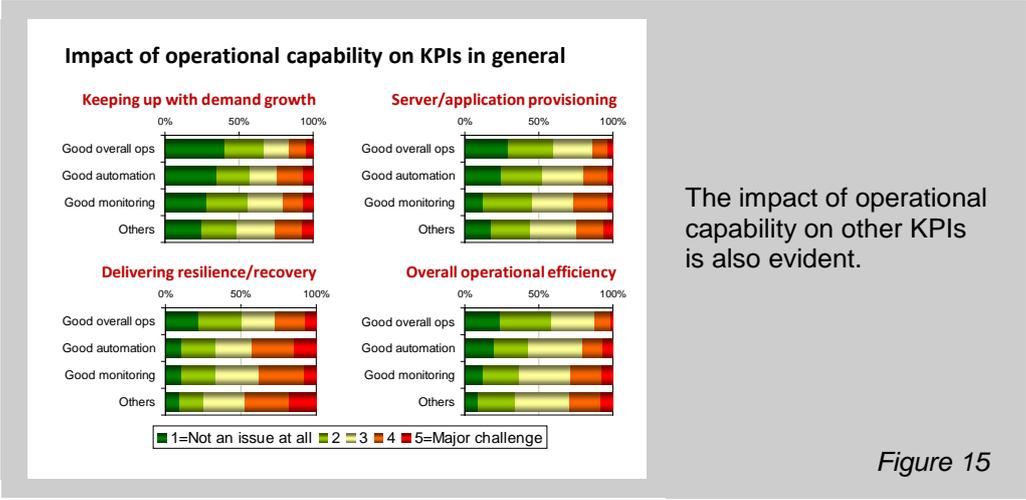
This in itself is a very informative picture and is typical of something we often see in many different contexts, which is the principle of 'good begets good'. What we mean by this is that organisations exhibiting leading or advanced behaviour in one area have a tendency to be more advanced in other related areas. In this instance, those with good monitoring capability are more likely to have good automation in place, and vice versa.

But does any of this have an impact on the quality of service delivered? Well, the answer is 'yes' when we look at operational efficiency (Figure 14) and at our broader set of service delivery KPIs (Figure 15).



Not surprisingly, key capabilities in the areas of monitoring and automation have a marked impact on overall operational efficiency.

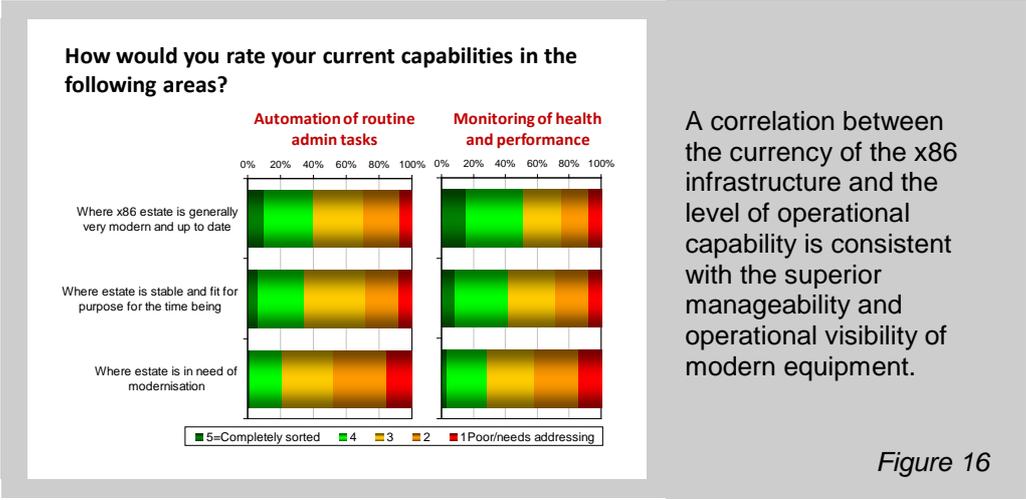
Figure 14



The impact of operational capability on other KPIs is also evident.

Figure 15

Furthermore, bringing some of the above analyses together, a correlation is observed between the currency (i.e. age and specification) of the x86 infrastructure, and the level of operational capability in place in terms of automation and monitoring (Figure 16).



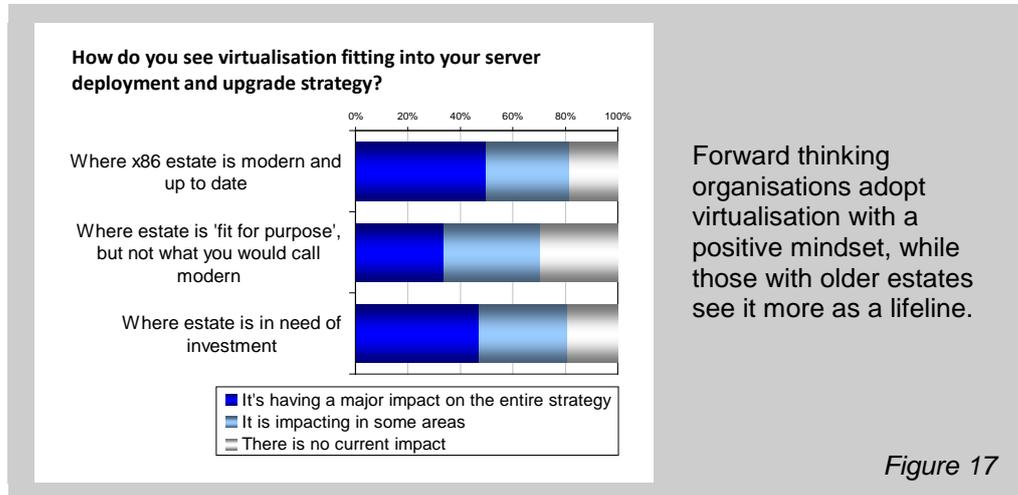
A correlation between the currency of the x86 infrastructure and the level of operational capability is consistent with the superior manageability and operational visibility of modern equipment.

Figure 16

The 'good begets good' principle is undoubtedly contributing here too, but the picture we see is also consistent with the impact of superior manageability and greater operational visibility associated with modern equipment.

## The role of virtualisation

Our discussion of how x86 estates are evolving would not be complete without saying a few more words on virtualisation as it is clearly a big driver for change in the technical and operational arena as we have seen and overall, three quarters of those participating in our study said they had embraced it as part of their plans and activities. What's very telling, however, is how commitment to virtualisation relates to the currency of the x86 environment, with the two extremes standing out (Figure 17).



This highlights two common situations and mindsets with which virtualisation is taken on board. Forward thinking organisations, with arguably a higher degree of maturity, see it as a way of enhancing server delivery. They are already in a pretty good position, have equipment that is well suited to supporting a virtualised approach, so moving forward in this direction is a natural way of enhancing the way they operate and the value they deliver.

IT departments having to cope with the consequences of aging equipment, maybe through no fault of their own because of budget constraints imposed by the business, can often see virtualisation as a lifeline. As an example, a single machine based on the latest multi-core processors can be used to replace several (often tens) of old servers, a move that can pay for itself very quickly in terms of power, space and operational savings, as well as dealing with resilience and quality of service issues typically associated with obsolete kit.

## Pulling it all together

The evidence suggests that a modern architecture that is properly utilised, monitored and managed leads to better performance in the areas of responsiveness to changing demands, time to benefit for application related investments, business risk management, and overall operational efficiency.

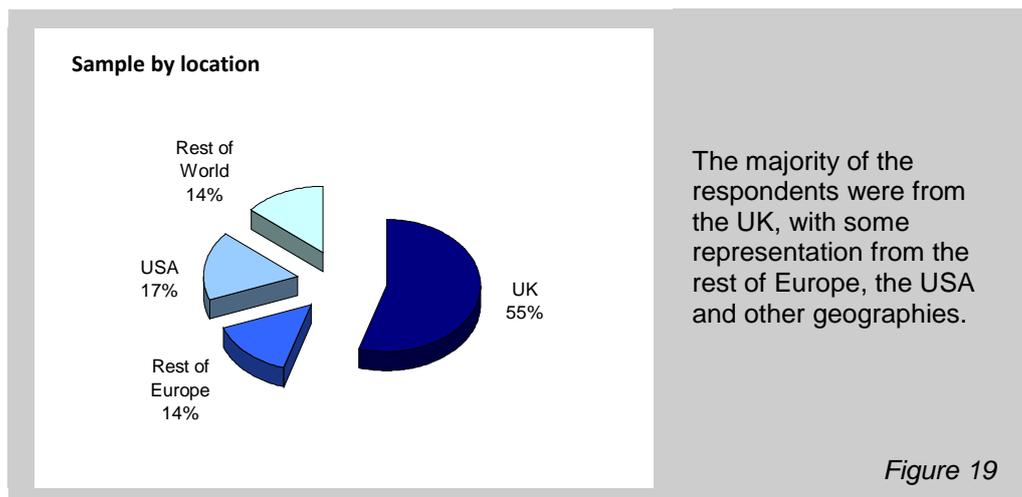
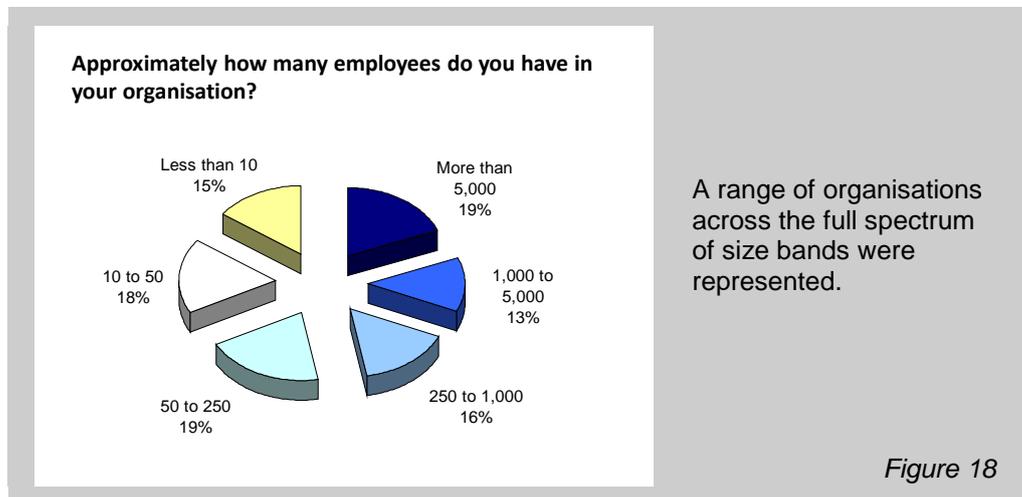
When reviewing current capability and looking at modernisation options, however, it is important to think in a joined up manner. While it is possible to focus just on hardware replacement to deal with issues of obsolescence, lack of vendor support, and software compatibility, or to drive a discrete initiative to look at operational policies, process and tools as part of a service management optimisation exercise, it is much more appropriate to consider the two together, with the overall objective of creating an efficient, flexible and well managed virtualised environment. Modern equipment is inherently more manageable and capable of supporting virtualisation in an optimal manner, as well as supporting greater visibility, so dealing with either hardware upgrades or operational improvement alone means opportunities will be missed and ROI will not be maximised.

Perhaps the biggest challenge in moving forward with this kind of holistic approach, however, is getting everything lined up and coordinated, not just technically, but also in terms of budgets and politics. In many environments, for example, all of that aging equipment is notionally owned by a part of the business, and breaking down years of convention and assumption here can be hard. The best advice we can give is therefore to define the problem in terms of overall service delivery and make sure infrastructure modernisation is acknowledged as a legitimate part of the business agenda.

## Appendix: Study Sample

Feedback was gathered via an online questionnaire published via The Register news and information site ([www.theregister.com](http://www.theregister.com)). Respondents, 979 in all, were largely IT professionals representing a good cross section of job functions and working in a range of different industry sectors.

The composition of the sample by organisation size and geography was as follows:



The study was completed in October 2009, and we would like to take this opportunity to thank all of those who took the time to participate. Your help is very much appreciated.

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