The magic triangle

The three key factors that influence data center design

> Whitepaper

The magic triangle

Once upon a time it was so much easier. Data center design decisions could generally be plotted along a single axis of construction cost and resilience. As long as everything was done in a prudent manner, increased capital expenditure resulted in increased resilience.

A Tier IV data center would cost more than an identically sized Tier III resilience site. It wasn't entirely simple though. The steps along the axis are not all the same size. There were areas where small amounts of expenditure could result in large increases in resilience. Likewise, large levels of expenditure could sometimes result in only incremental increases in resilience.

Relation Cost/Resilience

Figure 1

Striking this balance between cost and resilience was the key to having a successful data center for the needs of your business – a balance that was not always achieved during the fervour of the dot-com boom. Many battles were had between IT Departments and Real Estate Departments worldwide finding compromises where necessary.

A good professional team could work with the occupier to match their expectations in terms of cost with their requirements in terms of resilience. Energy efficiency was sometimes considered (although rarely), but without defined measurement tools it was difficult to define and was generally a by-product of the more core decisions.

The last 5 years have seen the data center industry change in this simple decision making process. Energy efficiency now holds an equal top billing in the decision process, so the simple decision line has become a much more complex triangle. Critical decisions can now be plotted along each of the three axes. Once again however, small changes on one axis can have a dramatic effect on the others, balance is paramount. Taking a simple motoring analogy, today's car purchases are not only driven by the cost and perceived reliability of the car, but also the MPG achievable.

See the side panel for some worked examples. As you can see, the effect on the three axes is not always of the same magnitude. Furthermore, whilst changes to capital spend and energy efficiency can be calculated, resilience is not entirely calculable. Yes, you can carry out a single point of failure analysis or put together a set of nines, but ultimately the beauty of resilience is in the eye of the

beholder. Taking the example of battery autonomy; reducing the duration from 20 minutes to 10 minutes would be seen as totally unacceptable to some, and a massive risk to the IT infrastructure. Others, (the author included) would say it makes no difference, if the generators haven't started within 10 minutes they are unlikely to start within the next 10 minutes (and in any event if the cooling is not supported on the UPS the temperature would be out of control in far less than 10 minutes anyway). Therefore it is not possible to accurately "score" decisions in a purely scientific method.

In an ideal world, a newly constructed data center would be highly resilient, cost little to construct, whilst remaining highly energy efficient. Can this be achieved in reality? There will always be a trade-off, which will ultimately be driven by whichever of the points of the triangle are deemed to be most important to the data center user. Below are some examples of how this works in practise.
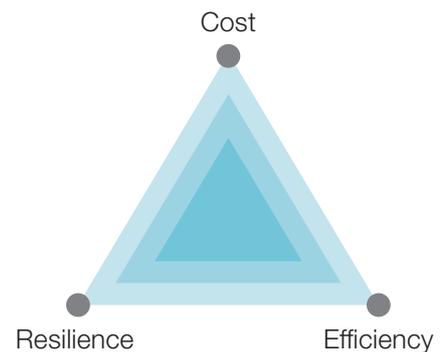
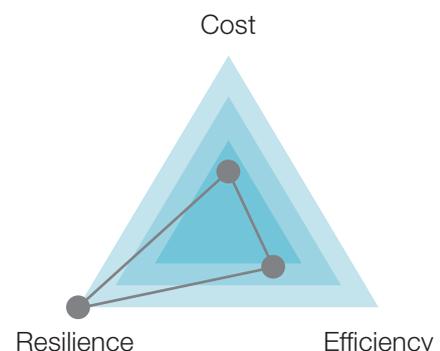## Ideal Data Center

Figure 2

Financial Institution

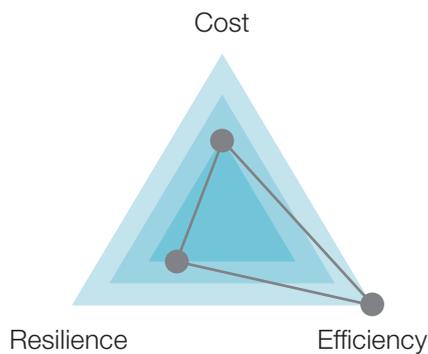Figure 3

The magic triangle

Internet Company
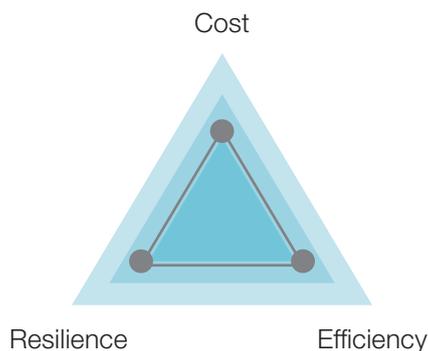

Figure 4

Systems Integrator/Wholesale landlord

Figure 5

Decision Making Process	Stakeholder
Resilience = Risk	IT Department
Cost = Capex	Real Estate Department
Efficiency = Opex	Operations Department

Going back to motoring, many decisions can be streamlined while ensuring that the best balance is achieved. When buying a new car, most resilience decisions have already been made for you – reliability is selected by picking the manufacturer in which you have the most confidence – remember the Skodas of old and their new VW produced relatives. Efficiency is also simple to analyse with a limited selection of engine configurations. What then with cost? Well most of the decisions are made for you by an established manufacturer – number of wheels, body construction, etc. The customer merely "tweaks" an established design to suit their requirements, perhaps by adding a sunroof, alloy wheels or picking an estate rather than a hatchback.

Outsourcing can offer the data center user an alternative to ownership that simplifies these decision making processes. Established wholesale data center landlords provide a perfect balance between resilience, cost and efficiency. Resilience and efficiency have been honed over years of successful operation to provide what many believe to be the best solution for their business. In order to stay competitive, landlords will continually adapt their designs to reflect the changing demands from customers. Finally, with outsourcing, the change of a construction cost into an annual rental can transform our decision triangle back into a decision line – Resilience versus Opex. A simple Total Cost of Ownership (TCO) calculation can now be compared against the resilience achieved by the facility.

If we take a bank for example, resilience of their operation will be critical and so will drive their data center decisions – normally down a Tier IV route. As a result, the construction cost will react accordingly and will likely be very high. Efficiency will take a back seat in the decision making process, ultimately ending up being as efficient as possible given the circumstances.

So with three key decision factors to consider, what does this mean for the decision making process itself? The corners of the triangle: Resilience, Cost and Efficiency, could equally be written as Risk, Capex and Opex respectively. It is evident that in most organisations there are individual departments or stakeholders responsible for these elements.

In large organisations, these three stakeholders may not be in regular communications with each other and may not even be present at the same time during complex discussions or negotiations for new data center projects. This leads to a battle that may result in a compromised decision making process leading to a non-ideal solution to the corporations data center needs and aspirations.

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About the author:
He originally trained as a Chartered Quantity Surveyor, before specialising in Project Management for datacenters in 1999. He has provided advise to tenants looking to rent space, end users carrying out self-builds and most recently developers acquiring and letting sites. At e-shelter Adam Tamburini initially worked in development but is now more heavily involved in international sales.

About e-shelter

High-availability data centers are the backbone of the digital economy and the Internet. Since 2000 e-shelter designs, builds and operates high-availability data centers, whose infrastructure guarantees the highest standards of physical security and operational reliability. e-shelter operates approximately 90,000 sqm of data center space, on eight sites. 60,000 sqm space alone are located at e-shelter's main site in Frankfurt, Germany, making it Europe's largest single data center site. Additional sites are located in Berlin, Frankfurt, Hamburg, Munich as well as in Zurich, and Vienna. Among e-shelter's clients are fi nancial services companies, telecoms operators and IT service providers as well as cloud service providers. As a part of NTT Communications Corporation e-shelter provides access to a network of 140 data centers around the world.

Our own security personnel of e-shelter security guarantees the security of our data centers and develops safety concepts according individual requirements.

With our extensive experience in operations of data centers we are a sought-after contact especially when it's about individual solutions for complex projects and high power density. Because of the size of our data centers we offer the necessary flexibility for hybrid IT solutions and direct access to cloud providers in particular.