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Digital Transformation
Strategy | Technology | Digital | Operations

DIGITAL TRANSFORMATION

Digital Edition

By Dr Mark Baker

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ABOUT THE AUTHOR

Dr Baker has led over 20 years of digital transformation with dozens of digital projects, from Pharmaceuticals to FMCG, from Fashion to Cancer Research, and has been in a position to gain deep insights into the internal processes of some of the leading consumer brands in the field.

He taught Digital Systems at University of Glasgow, was a National Physical Laboratory Research Fellow in Experimental Psychology at University of Cambridge and has led projects in Mobile, E-commerce and Social. He has a deep understanding of digital transformation in organizations from start-ups to Fortune 500. Using and developing Agile methodology he has led multiple project teams in parallel, working on multiple projects for major clients. He has a deep knowledge of UX design as well as current technologies in Predictive, AdTech, Mobile, Social and E-commerce.

He started programming mainframes when he was nine, started his first start-up in his teens, developed internet applications before Mosaic and Netscape were launched and developed an award-winning one-click purchasing system in 1997. He remains passionate about digital transformation and making the customer experience as efficient and user-friendly as possible. He has been honoured for his innovative work in E-commerce by BT and the Express Newspaper Group and for his creative work in the Toshiba Year of Invention Award.

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Also by this author

The Chief Digital Officer Handbook
Featuring interviews from Chief Digital Officers at

Ogilvy & Mather
Telegraph Media Group
The Economist
UK Ministry of Justice
Time Out
The Metropolitan Museum of Art (New York)
M&C Saatchi Group
PwC (PricewaterhouseCoopers)

and over a dozen leading digital organizations.

CHAPTER 1: WHAT?

This book is aimed squarely at those involved in the decisions around digital transformation – do we need it, what will it look like, how do we do it. It covers digital transformation is the broadest sense. It recognises that every organization is different and has different culture, needs and dynamics. One of the key differences is whether an organization is going to be reactive, and wait for the changes to sweep over it, or pro-active in its planning of transformation. This book allows the choice to be pro-active to be an option even in an uncertain future.

If you are a major bricks and mortar retailer looking for a substantial opportunity my experience is that there is vast potential if led by the right chief digital officer or consultant and massive pitfalls if the transformation is too short term and “practical”.

WHAT IS DIGITAL TRANSFORMATION REALLY?

It seems a strange question, but in years of experience in varying environments from Start-up to Fortune 500, Government to cutting edge tech, one thing I have definitely found is this: while this question is something that almost everyone has a ready answer to, the answers as I've dug down have revealed themselves not only to be different, but actually not even to overlap. One thing that *is* agreed on is that Digital Transformation, whether within a corporation or within an industry, is the largest change sweeping businesses and organizations today.

At any given time organizations seem to believe that they already have it in place – "after all we have PCs on every desktop and a web site in place already" but stopping there means that they probably won't be around to see where their rivals are planning to go to today. People with shorter planning horizons often see

Figure 1 Digital Transformation is much more than just having a web site or a strategy for digital in general.

the changes as being less significant – a corollary of Bill Gate's maxim that "We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten."

This is a very different way of thinking from the purely linear and tells us that whatever an organization has done so far, it is almost certain that the winners in ten years' time will have done vastly more by the time the wave of transformation is completed.

We can get an idea of levels of transformation by considering typical planning horizons. Specifics vary from model-to-model, business-to-business, but Horizon One might be having a web site and email, as well as adding on separate development of Social, Mobile, Apps without a platform approach and without sharing data sources and analytics.

By the end of Horizon Two a company will typically have a digital transformation portfolio approach that includes Social, Mobile, App and Cloud (SMAC). Integrated SMAC treats all these as add-ons to the company's core platform. ULTRA PERSONALIZATION IS LIKELY TO BE IMPLEMENTED I.E. personalization which explicitly creates a non-aggregated digital profile of every user and customer on a system. This not only contains personal preferences and purchases but typically the full digital footprints and analytics of the individual over all available channels, e.g. social, mobile, app, loyalty cards, multichannel purchasing, multiple computers and devices etc. This might be by Identified Ultra Personalization, IUP, or by Anonymized Ultra Personalization, discussed later. All this leads to big data generation, which is why cloud is often implemented at this stage. By this stage there will also be a demand-driven supply network driven by customers demand although this will continue to be refined from this point onwards. This isn't just about increasing sales. What we will see throughout this book is that once any single major player in a market implements a demand-driven supply network they will continue to carve away the most profitable parts of their competitors market share until the competitor also implements a demand-driven supply network. For the competitors this becomes an increasingly difficult task as they fight a rear-guard action. This transformation to a demand-driven supply network will not occur in a single

step and as the company matures digitally the data inputs to the demand-driven supply network will become more

In the context of this stage, Jonathan Sackett former CDO of Ogilvy and Mather told me in an interview that “historically people thought of digital as a series of destinations, versus thinking of digital as, the profound insights that it can provide. You can reverse engineer any of your initiatives by looking at search vernacular. People are constantly telling you or your company what’s on their minds by their activity, through the things that you are taking and observing from them from cookies, the way that they’re acting and interacting socially or in social media. Those insights are just as powerful as *building* your footprint because they’re going to tell you what’s on people’s minds. *Changing* vernacular or *changing* what’s on people’s minds is way more difficult and more expensive. So I think through this journey so far - what it’s taught me to do is watch, listen, learn and react, more than anything.” (Baker, 2014)

Both Amazon and Alibaba fit into the Horizon Two category. Potential is extremely high even at this level and even in 2012, two of Alibaba’s portals handled $170 billion in sales with the initial public offering (IPO) on 19 September 2014 giving a market value of US$231 billion[1]. It’s very clear that development does not just stop at this point.

At Horizon Three we are reaching the current cutting edge for competitive advantage and innovations are super-easy to use but complex to implement - things like UNIVERSAL REPORTING**,** which allows company executives to have a single dashboard or control panel where every key metric of a company is reported in real time, NO-CLICK MOBILE SHOPPING**,** and PROXIMITY APPS, (including iBeacons) all of which are discussed later. In the consumer market simple devices like Amazon Echo have changed the way users access information once again beyond touch glass and squinting at screens and the channel monopoly and evolving back services that this allows are part of the next revolution.

What’s the difference in scope between the CDO, the CIO and the CTO?

You might ask, “Won’t the CTO/CIO do this stuff?” The truth is that transformation falls outside the CTO’s remit. The roles of the CTO and CIO are to keep things running stably. The CDO’s role is to disrupt, although as we’ll see this means being far more diplomatic and sensitive than the CTO and CIO have to be.

Figure 2 The role of the CDO spans those of a number of C-Level staff. To actually achieve a transformation the CDO must be empowered and report to either the CEO or the board directly.

James Minter of the Chief Digital Officer head-hunters Hannington Tame[2] has this to say about the CDO’s position:

“I think that’s where there’s an interesting mix, where the CDO sits and pretty much has to make out that job and translate between those three stakeholders, the IT, or tech, or data analytics, and stuff that the brand marketing emotional side of business and then the … and the brain which is the corporate, the board, and manage to make sure the internal communications around digital are as efficient as they can be.” (Baker, 2014)

What if I don’t want to play this game?

By its very nature digital transformation is likely to be highly disruptive and unsettling. Unfortunately the change is happening all around you, it’s a long term one and the well-founded consensus is that if you don’t take part you will be destroying your organization. There are a few games where you can’t just take your marbles home and refuse to play. We know about death, taxes – well another one is refusing to adapt in a changing world. As we look at the case studies of casualties and successes so far we begin to see that the evidence shows that everyone using existing methods will be swept away into history.

Figure 3 Steps in a transformation.

The English writer and humorist Douglas Adams give us a way to understand this way of thinking in three simple laws.

Anything that is in the world when you’re born is normal and ordinary and is just a natural part of the way the world works.

Anything that’s invented between when you’re fifteen and thirty-five is new and exciting and revolutionary and you can probably get a career in it.

Anything invented after you’re thirty-five is against the natural order of things.

What do we have to do?

I interviewed Jaya Deshmukh, Director of Digital Transformation at PwC Consulting[3] for this book to get her industry insights into what is involved. This is what she had to say:

“PwC Consulting, if you look at the latest Gartner reports, or if you look at the Forrester reports, you’d see that they’d been doing a lot of work in the space over the past few years and are positioned in the leader’s quadrant. Some of the reasons for being in the leader’s quadrant for PwC is because they’ve done something remarkably well and I really, really like the philosophy and that’s why I joined PwC. It’s because that they believe that, you know, we don’t need the digital strategy. What we require is a business strategy for the digital world and it just makes so much sense.

“So I think when we talk about PwC and their philosophy for digital, what they’re really saying is a digital strategy perhaps is limiting the impact of digital in today’s world. It’s really a business strategy for the digital age and we do know that the digital age is here to stay for a considerable long time and it’s not about saying, “Hey, how do I have a multichannel strategy or you know, how do I, you know, choose to go with an API structure?” These are not the questions that are really being asked. The questions that are really being asked are…you know, “Customer journeys are changing today because of what digital has done and therefore, my acquisition or my retention, you know, frameworks, or the way I’m going to go out and engage with my customers, needs to change. So can you help me to manage this change?” So there’s a difference between the two things to say, “Here’s a digital strategy”, “Here’s a multichannel strategy” while on the other hand you’re saying, “Hey, how do I actually…” The same questions, but asked for the digital age and I think there’s great merit in that position. So that’s all about PwC Consulting and their take on digital.”

So digital isn’t a part or a division. Digital is greater than the sum of all parts. As we’ll see

as we progress, if change is inevitable, it's likely to be transformative and revolutionary rather than incremental and evolutionary in many cases, and there is likely to be disruption and resistance. That doesn't mean that if it is planned ahead, like expert surgery or a space mission, it can't be mitigated in such a way that no individual step is traumatic, and the appearance of an incremental, step-wise process is retained. To implement this we need to start by looking at McKinsey's outlines of what will really be necessary (Bughin & Manyika, 2012) (Gottlieb & Willmott, 2014). Two basic principles emerge from their interview with eight hundred and fifty C-level executives.

Stakeholders must buy-in to the value created.

McKinsey's Gottlieb and Willmott believe that what is actually needed is not clear in organizations and that "Most organizations have only a basic grasp on the value that digital can create," with only 7% showing a clear understanding of what is at stake.

Figure 4 The digital tipping point: McKinsey Global Survey assessment of 850 C-Level executives' understanding of digital impact.

They go on to say, "to reap the rewards from digitization at scale, CEOs need to push their teams to understand better what they can gain from digital initiatives and to match priorities and investments with the areas of highest value".

Stakeholders must understand the scope of change needed.

Many companies expect much of their near-term growth to be driven by digital even if there is an ad-hoc transformation policy – perhaps a few apps or a re-vamp of the web site. In fact the ten year growth of Bill Gates' saying on the typical misunderstanding of non-linear growth – "We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten" – is only ever realized if appropriate change is applied systematically over that period. If there is no coherent long-term plan then what we observe is a series of short, unimpressive two-year type bursts that fail to actually transform the business. If stakeholders are demoralized by their short-term performance and piecemeal transformation, the unsuccessful ones shy away from more systematic transformation – claiming the approach is unproven in their industry and creating a vicious circle.

Figure 5 Viewing the transformation as an ongoing cycle.

McKinsey identifies that effective organizational structures, accountability, and meaningful metrics and incentives needed to drive digital transformation are largely lacking. "As executives become more involved in digital efforts, they must work to ensure that their structures and business processes are set up to take full advantage of the opportunities that digital efforts offer."

What is needed to get things going?

With 38% of McKinsey's survey's CEOs being supportive and sponsoring digital initiatives we can see that many companies have started this engagement, but what do you do to get started if you are one of the other ~60%, or even if you have started some initiatives but don't have time to develop a fully integrated plan or strategy?

The most effective way forward, to start with a small step, is for the CEO or board to

commission a short report on the value and potential of such a transformation in their own company, outlining the basic steps for that specific company's transformation, recognising needs, suggesting possible visions. Such a plan would typically involve a week or less of work from a consultant or interim or contract Chief Digital Officer and might include a SWOT analysis, with implementation falling outside its scope.

Jaya Deshmukh told me little story that gives some interesting insights:

"So it's a little philosophical. Indian mythology says that we live in three worlds, all the time. And the three worlds that we live in are Me, myself and everything that's within myself so that's Me, Myself is my friends, relatives, my immediate surrounding and Everything else. So these are the three worlds that we inhabit at any given time. What digital really does is that it transforms each of these three worlds that we live in.

"If you look at digital natives, for them, their identity, the Me is 90% defined by what is in that world or in what they stand for in the virtual world. So if you look at my daughters, they get up in the morning, to Instagram[4]. They wake up in the morning, "Ting-dang", Whatsapp[5] group. They are totally immersed in it. For them, to get out of the house, to get up, bath to go to school is dependent upon some app that they have on their phone. So they compose music, they write their poetry, they do their homework, everything is there. So their whole definition…so my daughter's highly concerned about her Instagram status and followers than about how clean her room is.

"Right? So what's digital for them? Digital is who they are. If you start talking about a digital strategy, they're going to look at you saying, "What the hell are you talking about?" because their world is there. You can't have a strategy for their world. You can have a dialogue with their world. When you look at people who are older, there's where I put myself. I'm in the 40's. So for us, it was a generation that was already older when we were adults when this came and hit us. For us, this is being…for us, digital is a world of convenience. It's a world of setting ourselves free. It's a world of being able to get out and get more out of our time because we are so…time is so precious for us. So for us, digital is about freeing ourselves and if you take the generation beyond us, then I think for them, it's all about connections. It's all about meaning and that's why…from a customer's perspective, these are the three things that we need to look at. From an enterprise perspective, again, this is my opinion. Either they see it as a…you know, as game-changing as when we talked about leadership, people culture, right? So I think we need to say [that we need] leadership, people, culture, digital. Some people like to replace it with technology. So it's a macro lever for an enterprise."

I asked Jaya for three questions that would help with this understanding and she had this to say:

"This is a question I would ask the Board. 'How long are you committed to this journey?'

"I think the second most important thing to ask yourself is, 'Which of the three worlds am I really trying to impact?' Am I trying to create products and services for the digital age or outcomes for the digital age or am I trying to engage better? So what of the three am I trying to do?"

"If a client says, "I want to do all three." I tell them, " You can't do this." You've got to

specifically choose one and then the others can be second later.

“So how long are you going to be committed? From what’s the duration of commitment towards digital to which of the three are you really trying to do?

“The third is, “What are you doing? Are you playing catch up? Are you trying to be a leader or are you really trying to innovate? What are you trying to do?”

“So I always lead with these three questions.”

CHAPTER 2: WHY?

In the late 20th century digital transformation, in the form of E-commerce, CRM and improved communications, gave companies access to new markets and a competitive edge. What we are learning, time after time in the 21st century, is that digital transformation is now vital to companies' survival. Reaching new markets or "keeping up" is one thing, but more than anything else what digital transformation allows us to do is extend the number of important operations which management can perform without thinking about them.

Figure 6 Why Transform?

The philosopher Whitehead actually summarized that whole process when he said, "Civilization advances by extending the number of important operations which we can perform without thinking of them," – the reason being of course that we do more without being bogged down in details - and that's the whole essence of what we are doing when we go further in digital transformation. This might seem obvious or trite but it is neither. What it is, is fundamental to understanding what allows companies and organizations to survive in competitive markets. As such it bears thinking about in detail, specifically for your own organization.

The Altimeter Group (Solis, 2014) reported that, "Only one-quarter of the companies we surveyed have a clear understanding of new and underperforming digital touchpoints, yet 88% of the same cohort reports that they are undergoing digital transformation efforts." In other words, most companies Altimeter interviewed for this report claimed they are undergoing Digital Transformation, even though most of them don't know what it is.

WHY “DIGITAL” IS MORE THAN JUST “DIGITAL”.

Today, when we talk of digital transformation we mean restructuring an organization to use any and all information and network based technologies that increase its competitiveness, in a way that, over a period of time, excludes and out-competes un-transformed organizations. Of course in a literal sense when we talk literally about digital we mean something like expressing data as series of the digits 0 and 1 or using or storing data or information in the form of digital signals: digital TV, a digital recording or a digital computer system. However, if we think about it that way the whole scope of our understanding and what we are thinking of achieving is quite limited and fairly technical.

In the bigger sense of digital we mean a road map that includes the full process of making a business or service so that every part is freely accessible at every level with bounds set by explicit management models, not by physical constraints. Ultimately it means that all decisions become business or usage decisions, not technical ones.

It might be useful to give a simple example here, whose general principles apply to all digital projects. The Bodleian Libraries are a collection of approximately 40 libraries that serve the University of Oxford in England. One of the largest and most important libraries in the world, they hold 11 million printed items, 153 miles (246 kilometres) of shelving, including 3,224 bays with 95,000 shelf levels, and 600 map cabinets to hold 1.2 million maps and other items.

During the first generation of transformation I talked to senior librarians at the Bodleian, and the digital library projects that I was told of turned texts into bitmaps. Information was still effectively siloed and not electronically searchable within books, but the advantage of digital transformation at that stage was that the physical master copies were protected and copies could be sent with manually controlled access over electronic networks to authorized users anywhere in the world.

Figure 7 Some benefits are available in the short term, but full benefits of transformation are only felt when all services are transformed and then INTEGRATED

Later more advanced approaches, like Project Gutenberg, digitized the text into ASCII format so that catalogs of books were both digital and searchable as were the individual books. Beyond that, projects like the Google Books Library Project allowed the whole contents of all the books to be become accessible to a single keyword search that could search all text across volumes.

Of course, going digital goes beyond digitizing content and a more advanced model would determine accessibility, access and usage rights and payments, not just in the local user community but worldwide. In a project of that type any user would be able to do keyword searches across all the contents of a particular library and then usage and any payment would be determined for the specific books or documents they wanted access to, appropriate access would be granted and payment (if any) would be collected. If acquisition was performed on the same platform then requests for information, usage statistics, reader feedback and null-searches could be matched to the acquisition of new materials for the library, so as to better serve the users.

Ultimately even search goes further so that improved semantic search tools would allow search by meaning as well as by key words or phrases, as well as predictive analysis of future usage creating a proactive model, rather than a reactive model where the available content is always out of date.

At each stage the instigators might have expressed the view that they had “gone digital” and at each stage there would have been much, much more that could be done. This is, of course, just one specific instance of digital transformation related to libraries, but shows a simplified example of how there are many stages to a full transformation.

Why Revolution instead of Evolution?

As we can see, if we see digital transformation simply as the process of changes associated with the application of digital technology to a system, we get solutions that tend to be piecemeal and incremental. For that reason we create a “transformation” which simply does not give an adequate competitive advantage for survival. Let’s look at this more closely to understand why.

WHY COMPANIES DIE DEFENDING THE WRONG HILL[6].

Choosing the best solution for a digital transformation can be conceived of by using the evolutionary biology concept of fitness landscapes. These can be conceived of as ranges of mountains although they typically have very large numbers of dimensions in the real world. There exist local peaks or local optima (points from which all paths are downhill, i.e. to lower fitness) and valleys (regions from which most paths lead uphill). A fitness landscape with many local peaks surrounded by deep valleys is called rugged. Almost all difficult business decisions where Digital Transformation is needed occur where the business fitness landscape is extremely rugged – the existing management and processes are extremely good at reaching the top of the local optimum, and any small, incremental moves to reach another higher one are seen by stakeholders to be irrelevant to reaching the top of the local peak, and indeed movements towards the other peaks are provably using up valuable resources while moving downhill.

Like an evolving population, which typically climbs uphill in the fitness landscape by a series of small genetic changes, a highly optimized business is focussed on improving efficiency in its existing model until a local optimum is reached.

Figure 8 A highly simplified fitness landscape. The arrows indicate the preferred flow of a population on the landscape, and the points A and C are local optima. The red ball indicates a business that moves from a start-up to the top of a peak.

Figure 9 Visualization of two dimensions of a fitness landscape. The arrows represent various mutational paths that the business could follow while evolving on the fitness landscape.

One of the most significant things to realize is that local optima change with time so that the graph is like a moving seascape; an all out effort to retain a specific peak or market may fail as the market fades and consumers move to other channels, causing new peaks to grow on the business fitness landscape.

Even with the first stage shown above, hugely increased efficiencies can be implemented across the business. But this *is* just the first stage. It includes E-commerce for example, but is much, much more than that. It turns out that many fine-grained changes that are impossible to implement manually are readily and valuably automatable using a process of digital transformation. Without moving to the next stage companies will fall behind (and no longer be in a position to catch up) at what McKinsey (Willmott, 2014), describes as the tipping point. Strategists “often equate the term ‘digital transformation’ with a shift in technology investment, … thinking they are changing but in reality they’re only investing in technology. That’s not really digital transformation.” (Solis, 2014)

Why the rules of the game keep changing and what to do to win.

We’ve seen the influence of E-commerce, CRM, social media, mobile, omni-media, but experience of the past twenty years and a deep understanding of the underlying technology show us that an important thing to recognise is that new, game changing digital opportunities are emerging at regular intervals and will continue to do so over the next twenty to thirty years. In this environment, regarding digital transformation as a single move (or putting it off until next year) is a certain route to obsolescence.

Again Jaya Deshmukh of PwC gave some great insights about this. She says:

“Our philosophy [at PwC] is the fact that we truly believe that the world is in beta, and again, this is a powerful statement and I can, from my personal experience being in this industry not for so long, I can say, “Yes, that’s absolutely what’s going on.” I mean, earlier, if you look at it, any consulting person would start talking about, “Oh, what’s the current state, what’s the future state, what’s the current operating model, what’s the target operating model?” but today, you can’t have a…there’s nothing called steady state.

So you can’t really have a target operating model because it’s constantly evolving. It’s constantly changing and as a result, you can’t really say, “This is my strategy and this is the way it’s going to be and it’s fixed and not flexible.” We have…it’s simply evolving at a very, very rapid pace so the entire way an organisation gets structured and the way it goes to market, or the way it treats its employees, has to be in this flexible, evolving, almost agile mindset kind of a framework. That’s what we mean when we say that the world is in beta.”

A newly emerging example of a type of transformation that is just becoming possible is Dynamic Environments. Dynamic Environments allow the sorts of changes where a properly digitally transformed business has the ability to spot opportunities that might span just a matter of seconds. Gartner Inc. introduced the concept of a “business moment” — a transient opportunity that is exploited dynamically —and expects these moments to occur more and more frequently as enterprises migrate from today’s world to the digital business world (Rivera, 2014). If you reflect carefully and understand the model it is apparent that Google’s $50B+ pa revenue depends entirely on software that does just that.

One part of the Digital Transformation story (but only one part) is in marketing, and Accenture’s report, “CMOs: Time for digital transformation”, discusses this in detail (Baiju Shah, 2014). 78% of Accenture responders say that marketing will undergo fundamental change over the next five years. The top three changes cited: analytics, digital and mobile. High-growth companies in particular say their investments in these three areas are already paying off, especially in improving customer experience. They anticipate that digital budgets will account for more than 75% of the marketing budget, and Mobile will account for more than 50%, by 2019. They also anticipate that marketing will become more of an on-demand information provision function, with some anticipating that Marketing, Sales, and Customer Service will be merged into a single function.

A study by MIT Sloan Management Review and Capgemini Consulting involving 1559 executives (Michael Fitzgerald, 2013) reported that “companies now face a digital imperative: adopt new technologies effectively or face competitive obsolescence.” They go on to say, “While there is consensus on the importance of adopting digital technology, most employees find the process complex and slow. Many say their leaders lack urgency and fail to share a vision for how technology can change the business.” To implement change effectively they say that what is needed is “leaders who share their vision and define a road map, create cross-organizational authority for adoption and reward employees for working towards it.” What’s more though, they need cross-cutting reorganization which can be extremely difficult to implement internally.

Why? – Examples from Retail

Interestingly Forrester Consulting (Forrester Consulting , 2014) carried out a study involving in-depth surveys with 256 US and European retail and manufacturing decision-makers involved in digital commerce initiatives and 1,503 multi-channel shoppers, revealing a disconnect between what consumers want from an omni-channel retailer and the omni-channel capabilities that retailers are providing today.

They say, “Omni-channel retail is fast becoming the norm. Consumers have heightened shopping expectations in the era of omni-channel. Despite massive investments in people, process and technology, retailers are struggling to even come close to meeting the omni-channel expectations of their customers.”

KEY FINDINGS WERE:

Technology investment is critical to enabling exemplary omni-channel customer experience. As consumers expect retailers to provide consistent and unparalleled service across all touchpoints, retailers must adopt new technologies that enable this. Technology investment is often needed to create product and inventory visibility, to enable sales associates to understand customer preferences and purchase history, and to enable the retail store to act as a local fulfilment center.

Omni-channel customer experience is now a brand differentiator. Today, many retailers and branded manufacturers see omni-channel maturity as a key brand differentiator, with increased customer satisfaction, loyalty and brand perception highlighted as the top benefits. This explains why the CMO, not the CIO, VP of E-commerce, or head of omni-channel, is most often responsible for the strategy and execution of omni-channel order fulfilment initiatives.

Many retailers have reached a false state of omni-channel comfort. Having invested in some level of omni-channel capabilities, it may seem they are far along in their omni-channel initiatives. Yet customer expectations are constantly increasing. Features that only yesterday seemed game-changing are rapidly becoming commonplace. Retailers must continually revisit and potentially rewrite their omni-channel strategy to keep up.

New titles alone won't cut it — retailers must abolish siloed channel strategies altogether. And regardless of who is ultimately responsible for omni-channel, a successful strategy requires more than just deep cross-functional alignment. Many retailers today are going further by unifying their P&Ls, organizations, and technology to ensure an obsessive focus on the needs of the customer rather than the needs of legacy channel structures.

What are we trying to achieve?

Almost every process in every company today can be transformed digitally, although not all will be cost effective to carry out nor will all yield useful, tangible gains. Each business will have its low hanging fruit – processes that are easy to transform and that will yield good returns in the short term. Most will also have other changes that may not be easy, cheap or painless but are essential for the business's long-term survival. We aim to achieve both of these as part of a long-term digital transformation. The low hanging fruit are attractive but fundamental changes are vital.

Figure 10 Overview of a successful process.

Figure 11 Segment of an integration plan showing partial integration of functions.

For individual users in specific regions the site, of course, remains completely constant.

Big data from fine-grained data from site(s), social and mobile will give deep understanding of customers, markets, products, team and media in intimate, actionable detail.

Cluster analysis of site combined with social and segmented storytelling will massively increase brand awareness and positioning.

WHAT CAN WE DO?

Immediately accessible merchandizing gains are available through using the insight stream, the flow of user preference and behaviour insights gained in real time from omni-channel analytics and applying it to app, mobile and site navigation, on-site recommendations and upsells, email follow-ups, personally targeted advertising and personalized customized mailshots.

It is important that personalized, targeted advertising information comes to the consumer through multiple media, although there will be a different, unique version of the message delivered across traditional media channels, personalized direct mail, social networks, Instagram, Facebook, Twitter, Tumblr and newer media which are added and tested as they emerge. On the other side of the coin user data from all these media streams should be obtained and acted on in real time, remembering always that the most cogent user data, the key factor to optimise for, is always the actual monetary transaction.

Even without fully personalized advertising it is possible to use clustering to address multiple markets. Throughout the process it is essential to test everything that is done with digital using multivariate testing. Results should be tangible and measurable with hard figures.

The digital-agile approach – using the flexibility of digital data and media to generate quantitative statistics to allow informed decisions and even pivots to be implemented in real time, is different from the concepts of agile and digital used with a range of meanings and emphases in close proximity[7]. In the sense that it is unique it deserves a unique term which we can call DIAL (DIgital AgiLe).

Example of Immediately Accessible Merchandizing Gains from Digital

E.g. using Probabilistic Inference

- Site recommendations (e.g. accessorizing), typically 10%-20% lift in Fashion/FMCG.
- Site based market segmentation using cluster analysis
- Local markets
- Global markets
- Dynamically changing site navigation
- Dynamically changing offers
- Personalization
- Identification of favoured designers
- Personalized accessorizing emails
- Personal offer emails
- Deep personalization of mobile app

HARD DATA – CLEAR ANSWERS

Digital Transformation is often swamped by ‘good ideas’ based on gut reactions that make it difficult to make a firm business case for specific transformations. Perhaps the most important message that I can give is “test everything” and “test it to a specific statistical significance”.

This is essential so that everything is tangible and measurable with hard figures and so that the validity of each set of testing is also quantified. This is very different from mere analytics, which tell the business what is happening under the existing model, and is far more valuable and exciting. Of course, it’s simply not possible to do this manually – if we are implementing a complex transform, how do we separate out which of the dozens, hundreds or thousands of separate factors is really responsible for change? And if we only have a moderate level of statistical competence, the spectre of obtaining enough data for statistical significance is raised.

The answer is, of course, that it is “not that easy”. Easy solutions are typically already implemented and followers of those solutions are often on the wrong side of the Pareto split[8] – putting in massive amounts of work to obtain tiny gains and therefore assuming that they have already reached the point of diminishing returns.

What we actually do is to apply methods such as Taguchi methods or multivariate testing and multivariate analysis so that effectively a business can be testing hundreds of different variables at once. If this is properly implanted neither customers nor management need be aware of it, but a rich, valuable flow of information is achieved not just in marketing strategies, but also in customer segmentation and clustering and price sensitivity (to name just a few of dozens of tests).

“DIFFERENTIATED CUSTOMER EXPERIENCES”

One of the best short-term improvements that can be made is by presenting a differentiated customer experience. To most users the experience is most familiar on Amazon and eBay, but its application is a key factor in short term lift and long term survival. It is not just a question of saying “if you liked *this*, then you will like *that*”. Personalization means that landing pages (or app intro screens) are always relevant, improving bounce rates so that visitors stay on a web site or don’t simply delete a retailer’s app. From there every navigation element must reflect the user’s immediate needs. If there are five links from the home page they must go to the next five things that the visitor wants NOW, not five things that a web master or company executive thought were basic divisions of the company. Items shown at each stage should reflect the individual’s known buying preferences, e.g. interest in sales or bargains, items to match items already bought, and seasonal and weather related needs focussed on the specific buyer.

DEEP ANALYTIC UNDERSTANDING OF PROCESSES, CUSTOMERS AND MARKETS.

Deep analytics include not just page hits or even heat maps, but an understanding of how user behavior clusters. A different look, feel and navigation path is valuable for each region but multiple web sites for different regions may be counterproductive in the long term as these stop the sharing of analytics and deeper global customer insight.

A single configurable site can be far more versatile than five or ten different sites, and can present dozens (or even hundreds) of different site layouts, languages, products sets and designs, all being tested dynamically without day-to-day human intervention.

Implementing Automation.

Gartner notes that “Most will see digital business as a simple extension of an enterprise technology or an e-business past. … ‘digitization,’ or using technology to automate existing processes.” Gartner goes on to say, “That is no longer enough. To compete in digital business, enterprises must digitalize their models, and rethink their value in a world of people, business and things.”

Perhaps as a result of this McKinsey says, “Of the six trends, automation ranks the lowest”. This may well be because the first rank of automation has already been implemented by CTOs, but the complex needs of a truly transformed digital business have not yet been recognised.

CHAPTER 3: WHEN?

Perhaps the key question here is –"when is it too late?" When to act and where else it has happened link closely with creating the Vision of a company's digital transformation.

Figure 12 Asking the right questions can help form the Digital Vision of the company.

Let's have a look at some case histories to get a feeling for this.

Being the next Blockbuster or Borders.

In January 2005, Wedbush Securities stock analyst Michael Pachter called Netflix a *"worthless piece of crap."* He put a price target of $3 on the stock, at the time trading around $11; Blockbuster LLC[9], with its economies of scale and established customer bases, would simply destroy Netflix.

Barry McCarthy, Netflix's chief financial officer, recounts an earlier instance: "I remembered getting on a plane, I think sometime in 2000, with Reed [Hastings] and [Netflix co-founder] Marc Randolph and flying down to Dallas, Texas and meeting with John Antioco."

McCarthy recounts, "Reed had the chutzpah to propose to them that we run their brand online and that they run [our] brand in the stores and they just about laughed us out of their office. At least initially, they thought we were a very small niche business. Gradually over time, as we grew our market, his thinking evolved but initially they ignored us, and that was much to our advantage."[10]

What tough negotiator and turn around expert John Antioco missed when scorning the Netflix bottom line compared with Blockbuster's at that time, was that Blockbuster, which at its peak of had 60,000 employees and 9,000 stores, was clinging to a declining local optimum. He was making his judgement on the hard figures at the time and on his gut reaction of what he had seen happening over thirty years of non-digital turn around experience at 7-Eleven, Pearle Vision, Circle K, Tosco, PepsiCo and as CEO of Taco Bell[11].

Within six years Blockbuster had filed for bankruptcy, its market hollowed out by Netflix. Because the Netflix founder Reed Hastings was a Stanford computer scientist, he knew it would soon be feasible to stream movies, but he also knew the switch had to be timed quite precisely. Taking such a big risk too early would invite a bleeding-edge failure, while a few years later the field would be left to competitors. He also knew that having employees run shops, charging for rentals, late fees, etc. were outmoded relics of the past, while online service delivered by a virtual organization offered unbeatable value.

Despite Blockbuster's adjustments to its physical media model in the form of its DVD-by-mail service brought in in 2004 to compete with Netflix, development focused on retaining the waning local optimum focusing on elements such as choosing Blu-ray over HD DVD and bringing in "Additional Daily Rates," or "ADRs," for rentals not returned by their due date in the United States, making their physical model even less attractive. At a time when Netflix were committing firmly to the streaming peak by announcing that it

had reached a five-year deal worth nearly $1 billion to stream movies from Paramount, Lionsgate and MGM, Blockbuster were incrementally improving their hold on the declining physical media peak; in 2010, *Blockbuster By Mail* subscribers gained access to Blockbuster's library of console games, in addition to movies and television shows.

Borders Group, Inc. was an international book and music retailer based in Ann Arbor, Michigan. The company employed approximately 19,500 throughout the U.S. alone with 511 Borders superstores in the US as well as Australia, New Zealand and Singapore. The company also operated 175 stores in the Waldenbooks Specialty Retail segment, including Waldenbooks, Borders Express, Borders Airport stores, and Borders Outlet stores. Attempts to hold the local optimum included opening 14 concept stores nationwide, which included a Digital Center, offering select electronic devices such as MP3 players, digital photo frames, and the Sony Reader at a time when Amazon Marketplace was actively growing an alternative peak for such products.

Since 2001, Borders had outsourced its online book-selling to Amazon.com, redirecting customers to Amazon.com in a "smart decision" to focus on core business that effectively meant they were paying to build their nemesis's business.

Huge investment in music inventory and 'enhancement' of the store environment with digital video monitors left the company climbing a reducing local optima while Amazon climbed the growing internet sales optima, fed even more by purchasers going to Borders.com to buy online and finding themselves redirected to Amazon. On February 16, 2011, Borders applied for Chapter 11 bankruptcy protection and began liquidating stores.

When to Change Course.

Essentially the time when a business or organization needs to consider changing peaks (or at least having a plan B that involves climbing another peak in parallel) has been described by McKinsey as "the digital tipping point". McKinsey recorded and tabulated organizations' efforts to go digital — and drive growth through digitization — a process that they characterize as Digital Transformation. McKinsey also identified the issue that many have more work to do before they can scale their efforts and see material impact (Willmott, 2014).

You'll remember that the encyclopaedia definition runs something like this:

"Digital transformation refers to the changes associated with the application of digital technology in all aspects of human society. Digital transformation may be thought of as the third stage of embracing digital technologies: digital competence → digital literacy → digital transformation. The latter stage means that digital usages inherently enable new types of innovation and creativity in a particular domain, rather than simply enhancing and supporting the traditional methods."

As always the reality is more complex and of course more interesting. It turns out that almost all business processes that were formerly carried out manually can be analysed and transformed into a more scalable, more consistent and faster digital process. This includes everything from storefronts to stock control to supply chain, to customer relations, to marketing and beyond.

Are we nearly there yet?

Jaya thinks not. She told me, “The PwC point of view which I agree with to quite an extent, so where they talk about the Internet of things becoming the next important things, for me, it’s not a technology trend, really, that’s changing. I think it’s the fact that in the next five to six years, there’s going to be a demographic change and the demographic change is going to be led by developing nations such as India and China where you will have a huge market of youngsters who are true digital natives. So if you look at it in the next five years, you’re going to have in early adulthood, people who have grown up with technology. That’s the demographic shift because that’s…the expectation is going to change and we need to be ready for that shift.

So from the technology perspective, it could be the Internet of things, it could be, you know, as we say, contextual, localised, referential, responsive, carrying your own data cloud around with you.

So what I mean by data cloud is you don’t need to remember anything, it’s all there on your phone, it’ll put out all your introductions, everything. So you’re carrying your virtual backup with you as you walk, you know, and experience this world. So while those technology trends are going to come and hit us, I think the most important thing is the fact that there’s a demographic change and with that, customer expectations are going to change, the way we do business is going to change, and therefore, we need to have a business strategy that’s prepared for that age.”

The journey has just begun.

Suggested extra reading:

Crossing the Chasm: Marketing and Selling Disruptive Products to Mainstream Customers (Moore, 2014)

CHAPTER 4: WHERE?

So who is at the forefront of transformation? Where is it all happening?

Where is the Revolution?

Case Studies

The case studies in this section differ widely in their focus and implementation. Some are historic object lessons, others give insights into transformations that are occurring right now, stories that are unfolding as you read this, transformations at the cutting edge.

Not all transformations are narrow and focused on marketing or even supply chain.

In one key case in the Oil and Gas market I was called in by a senior digital talent in one of the Big Three "Big Oil" companies. The matter was mission critical and had a significant potential to cause a serious impact at board level. The business case seemed very clear and a technical solution while complex and expensive[12] was eminently implementable. It seems both to the internal digital team, myself and my consultation team, that this was a bleeding neck[13] need, but the internal team were not empowered to take the issue to the company's board and those that were empowered did not want the exposure of bearing potentially bad news. The final impact of the company being unable to handle this caused serious disruption at board level and to the company's stock prices. More than anything else this example shows the need to have C-level representation of digital at board level. There were many lessons learnt at the consultant and implementer level too which could have mitigated the effects that failing to transform created.

In another notable case I was called into Janssen-Cilag[14] to solve a big pharma digital transformation issue – one that was rather different from some of the other case studies below and somewhat bigger, but nevertheless very much a digital transformation. The issue was with Risperidone (/rɪˈspɛərɪdoʊn/ ri-spair-i-dohn) (trade name Risperdal, and generics) an antipsychotic drug used to treat schizophrenia (including adolescent schizophrenia), schizoaffective disorder, mixed and manic states of bipolar disorder, and irritability in people with autism[15].

Figure 13 Risperidone is a second-generation atypical antipsychotic that has improved the lives of hundreds of thousands of patients and their friends and families.

A vital part of FDA testing for approval of the drug for use involved quantifying exactly how Risperidone improved brain functions during sleep – which would be a key indicator of effectiveness. Working with renowned sleep expert Chris Idzikowski, what was said to be the largest commercial sleep laboratory in the world was set up at Janssen's UK headquarters in Grove, Wantage, and sleep quality was monitored using Electroencephalography or EEG. Classically, interpretation of EEG had been carried out by skilled technicians manually scoring or "eyeballing" the data (Rechtschaffen, 1968), but literally miles of charts were rapidly produced[16] and it was found that data on the scale that was required for testing of this type quickly swamped the number of available experts. Furthermore variations on human scoring were affecting the data – skilled technicians learned new things and spotted different things over a period of a trial,

invalidating earlier data.

By the time I arrived there was a physical warehouse of electronic data tapes as big as a small aircraft hanger, still waiting to be analysed properly. There had to be another way.

The transformation I brought about involved taking skilled manual scoring tasks of data analysis of banks of graphs, not so very dissimilar from those carried out by the more astute digital executive or financial trader, and automating the analysis in extremely sophisticated and powerful ways to spot trends long before the human eye could, in sets of data impossibly large for even big teams of skilled operators to monitor. It was the classic transformation from “Fleshware”, where a complex function is carried out using people rather than machinery, to automation[17].

It took algorithms modified from the US National Supercomputer Center, which were then improved in efficiency several hundred per cent, and a highly parallel approach, but ultimately the digital transformation proved to be the solution to taking Risperidone to FDA approval.

This is a case of true transformation, transforming not only processes in business, but people’s lives. The World Health Organization’s List of Essential Medicines lists Risperidone as one of the most important medications needed in a basic health system (World Health Organization, 2013). It has revolutionized the lives of tens of millions of people and of their friends, families and colleagues who were subject to their psychosis, which included delusions and hallucinations, or to their schizophrenia or bipolar behaviour. In financial terms, despite the massive cost of getting a completely new treatment through FDA approval, Risperdal went on to be J&J’s best-selling drug, generating worldwide sales of $24.2 billion from 2003 to 2010[18].

In another medically based study I was involved in, the challenge was to carry out medical research that would simply not have been possible in the pre-transformed period.

Sometimes the key sets of skills involved in a digital transformation are more fundamental than use of Big Data, although Big Data may still play a key role in the transformation. In a series of studies into the effects of different radiotherapy treatments, chemotherapy-radiotherapy combinations and radiotherapy-surgery combinations supported by the Cancer Research Campaign at Oxford University, I was able to apply every step of the basic philosophy of digital transformation to scientific research. This proved out the key factors in using Big Data in a field that has significantly improved treatment and cancer recovery for patients all over the world.

Over a year of research went first into developing analytical techniques that had never been applied in cancer research before, and then into developing digital versions so that studies that would previously have never have been possible, even by large, skilled groups of scientists, were now carried out in minutes on a routine basis.

Data quality and data integrity were essential – any mistakes would not mean unsuitable products being presented to consumers, but ultimately that the wrong treatment would be presented and lives would be affected tragically.

This was a workshop in learning to do it right. Deep automated analysis of key factors

was developed, while learning how to truly understand the integrity (or otherwise) of data and methods. All the time this work was completely unique in the field of cancer – not just in our world-leading laboratory, or in our global top-ten university[19], but anywhere in the world.

A further year was spent working out publishable big data representation and pivot techniques, as well as ground breaking modelling methods inspired by discussions with project leaders in the National Physical Laboratory. Data processing took months of CPU time and methods of viewing lemmas were developed to iteratively adjust further stages of analysis[20]. The results were data of a type never previously obtained in the field and led to my being invited to consult for a number of leading pharmaceutical companies in digital transformation, while some of my related work was awarded in the Toshiba Year of Invention.

Also aiming to be involved in medically related transformations, and on the cutting edge now in 2014, are Acupera, Doctors on Demand and LifeNexus.

Acupera, founded in San Francisco by Ronald M. Razmi, M.D, MBA aims to improve management and quality of care with their scalable, cloud based care coordination platform connecting a diverse and virtual care team through a patient-centric care plan. www.acupera.com

Doctors On Demand, founded by Adam Jackson, Jay McGraw and Senator Tom Daschele, aims to enable patients to seek diagnoses in their own time from certified medical professionals, by diagnosing patients using video technology.

Lifenexus aims to increase the quality of health care offered in hospitals and clinics with an iChip program to make available the health care records of patients, including previous operations, allergies and other important medical information.

In education, Zzish, founded in 2013 by Charles Wiles, aims to change the way that children learn both in schools and in their homes, by creating a new platform for learning that allows developers to build new mobile learning apps and games quickly and inexpensively. www.zzish.com

These are cutting edge technology companies aiming to bring about transformations across industries, but what about digital transformation in the mass of small and medium sized enterprises that are the vast majority of businesses?

In 2011, according to U.S. Census Bureau data, there were 5.68 million employer firms in the United States. Firms with fewer than 500 workers accounted for 99.7 percent of those businesses, and businesses with less than 20 workers made up 89.8 percent.

“Small firms accounted for 63 percent of the net new jobs created between 1993 and mid-2013 (or 14.3 million of the 22.9 million net new jobs). Since the end of the recession (from mid-2009 to mid-2013), small firms accounted for 60 percent of the net new jobs. Small firms in the 20-499 employee category led job creation.”

We are beginning to see now how the same basic principles apply across a huge range of human endeavours and each thing we learn can, with careful consideration and reflection, add to the toolkit that we can apply to everything else.

In the mid 2000s I started a program in which self contained agile teams based in India

addressed and supported the complete digital transformation needs of small and medium sized businesses turning over £2M-£10M ($3-$15M US) in the UK.

Project elicitation, analysis, specification and validation were typically incorporated into the pre-sales phase at the clients' offices, extracting and educating the client to create a shared vision of how the solution would enable business transformation rather than just act as an add-on, with the main part of each project starting with system architecture before handing on to remote teams.

Typical businesses included automation of a leading digital transcription and secretarial agency, automation of digital print houses, immigration service providers, real estate agencies and property investment firms as well as normal E-commerce operations.

Processes that were formerly highly labour intensive such as management of remote transcription teams and control of workflow were completely automated, increasing workflow volumes while freeing up skilled staff, bringing small and medium sized businesses and their clients some of the same benefits gained in transformation in larger organizations.

Powering the Revolution

What's out there to help you.

Digital Transformation experts often tell CEOs of the importance of centralized data and getting in control of data. CTOs shake their heads sadly knowing the years of investment that have been put in to diverse, incompatible systems designed with no thought of data unification and talk sagely about it being 'impossible'.

The CDO acting for the board or CEO has to cut through this, and today there are a number of tools available to do this.

Sequoia Capital funded Metanautix has a slogan "Navigating data has never been so fluid." And with their Quest product they provide a whole new way to intuitively navigate and analyze data from different sources as though from a single repository. By virtualizing the data supply chains they have created a basic tool for transformation that allows more fluid business decisions using data assets, adding fluidity to navigating data. I'm introducing it here, but we are going to hear about it more later in this book.

Solutions of this sort can be used in conjunction with advanced big data reporting like Marc Andreessen and Christopher T. Nguyen's Adatao, which helps enterprise users act based on intelligence from Big Data. The Data Intelligence delivered includes Visual Data Narratives, interactive visualisations and dashboards, live analytic collaboration and automated business insights.

Where do we find our information?

In 1996 two young Stanford students used a concept borrowed from the academic community for deciding the importance of scientific publications, to create a search engine called BackRub. The basic idea was that instead of building an index of the web and manually deciding on the importance of pages, an algorithm automatically crowd-sourced the decision based on the number of web pages that cited or linked to the target page (Brin, 1998).

Figure 14 Larry Page and Sergey Brin: Stanford University dropouts who invented a search engine called BackRub

The domain google.com was registered on September 15, 1997 for this service and formally incorporated into a company, Google, on September 4, 1998. At the time it was widely believed that the war for search engine supremacy was already over and had been won by the well-funded and capable AltaVista.

Figure 15 How Google overtook AltaVista - after everyone though the race was over.

Today's popular view is that the story of search is over and Google, with its system of creating a search system from the crowd, is the champion – for all time – and what is more, it is heresy that you might be able to go deeper than the crowd.

Just as in the days of Alta Vista the story of finding key information isn't over yet. Some solutions are similar in approach to Google, like Bobby Lo's Vurb which performs a relatively standard search but uses a completely different interaction paradigm resulting in a UX using 'cards' instead of tabs to create a contextual search engine.

Others are more radical and involve both a different way of instigating search and even a different underlying paradigm, moving away from words and towards underlying concepts. To dig deeper I interviewed a couple of leaders in the new revolution based in the Bay Area.

Predictive Analysis: Mining the future.

In late 2014 Salesforce.com chief executive Marc Benioff announced the launch of an "Analytics Cloud" product line putting the spotlight on the data-driven sales and marketing movement, and asking companies to re-imagine how they operate based on data.

While rear-view analytics of this sort are considered state of the art, some companies like Infer think that they can be even better when complemented with forward-looking predictions. If the last big thing was all about marketing automation and capturing data across every touchpoint, the next big thing will be all about turning data into insight and insight into action.

According to Infer founder and CEO Vik Singh, Infer uses forward-looking predictions to help companies win more customers. Vik's background is as a Architect/Director at Yahoo! and as a software engineer at Google, and at Infer he has used data science to model the untapped data sitting in companies' sales and marketing automation systems, which they combine with "thousands of external signals from the web". Starting from these huge data sets, the Infer platform crunches numbers to come up with an "Infer Score" for each lead, which is fed back into the client's CRM or marketing automation system in much the same way that AdTotum uses similar signals to create an index to predict retail requirements, albeit in a Hyper-Cloud. The client's sales teams reduce wasted effort and maximize their conversion rates by prioritizing sales efforts around the leads that are the best fit for current products and sales targets.

I talked with Jamie Grenney, vice president of marketing at Infer, about how forward-looking predictions compare with rear view analytics. Before joining Infer Jamie had eleven years experience at Salesforce.com in a variety of roles. He started building the

inside sales process at Salesforce and the bulk of his career was spent in the marketing organization and in products. When I talked to him here, he recounted that while Salesforce was an exciting company in late 2012 he was on sabbatical at the Aspen Institute, and started exploring the idea that very few Salesforce customers were taking a sophisticated approach towards using big data to predict their best customers. Salesforce had tried that at an adoption stand point but Jamie recounted to me:

"It was always very, very difficult to execute because you were vying for IT resources and you might get those IT resources for a sprint or two and then they would move on to other projects. So you know I was pretty excited about this type of idea … so I reached out to Vik and connected with them and he was kind of working on just this idea, so kind of came at this from a totally different direction and it was really, really refreshing, and you know Vik's perspective was sort of vicious about the data and letting the data talk. And so, Infer launched in about a year and a year and a half ago. And, really the idea was that we wanted to find the spot where predictive would unlock the most value and figure out how to do that at a scale. So how could we deliver predictive as a service to thousands of companies?"

Jamie says that lead volumes have grown so much that the company able to distinguish the good prospects most efficiently and fastest is typically going to win out.

You can read more from the interview in the Appendix.

Digging deeper

Twenty minutes drive north along the Bayshore Freeway from Infer in San Mateo is EverString. Founded in 2012 and rapidly securing over twelve million dollars in funding from investors such as LightSpeed Venture Partners, Sequoia Capital and IDG ventures, they are run by Vincent Yang, a former Investment Manager at Summit Partners and Investment Banking Analyst at J.P. Morgan.

EverString's slogan is 'We are marketing intelligence' and while today they identify and engage with the best customer prospects in mind, unlocking customer insight buried in data, they have a bigger agenda.

They work with a team of neural scientists, natural language processing scientists and distributed computer experts in order to deliver a high quality experience in their services. They also have executives who are early employees from Marketo and other leading enterprise technology companies. With mentions in Forbes magazine for their funding which will 'Help companies sell more stuff', Everstring aims to discover and find 'Your Ideal Customers'.

I talked to Vincent Yang about EverString's story and he told me a little of their background and how he built this from an analysis tool that he built at Summit Partners "to figure out which companies' growth was more interesting".

He says that with the traditional method of finding out which companies your sales and marketing should target you only have a few variables: employee size, revenue, location, and industry, "So [with the traditional method] you basically only use those four dimensions to filter out your ideal customers. We use 20,000 and more micro segments so that's why we will obviously be able to more accurately predict who's more likely to

convert.”

You can read more from the interview with Vincent Yang in the Appendix.

Where are the next Transformations?

Demand-driven Execution

We are going to go into analytics and predictive later in this chapter but like lean manufacturing these are just parts of the story that creates an effective digital transformation. In particular it needs to be understood that these really achieve maximum value when they are integrated not just with marketing but with a demand-driven supply network and demand-driven execution.

ANALYTICS

Analytics and targeting are some of the cutting edge changes and with that in mind Dstillery's Ad Analytics And Targeting was founded by Robert Hook in 2008. In 2011 they won one of many SIGKDD 'Best Papers' awards, and were awarded the title of 'Forbes America's Most Promising Company'.

Again, when interviewing Jonathan Sackett he gave an excellent insight about the value of "digital" analytics in the broader sense:

"We saw these companies and corporations were told to jump on bandwagons. So they jump on the social bandwagon, then they jump on the mobile bandwagon, but it becomes fragmented because there was never a unified approach to utilizing digital as a whole. Next, the back and forth or the "ping pong effect" between the television and your device needs to be thought through. So, now they've built a monolith, a website, but yet it was never open to mobile activity or to collect the *right* data. So what we've had to do is reverse engineer most of the things that were done, because every big company, every big corporation has a website, has a digital presence. Walmart, for example - we were agency of record for them. They built a website, but yet, the Web people weren't talking to the marketing people and they were housed in separate areas of the country. And neither of them were speaking with the store representatives. There is an interdependence of these parts whether one wants to admit it or not." (Baker, 2014).

It's worth noting that analytics can be very misleading when being used either to build a transformation built around a demand-driven supply network or demand-driven execution directly or predictively. For example, customers demand is hard to detect with many analytics models because out of stock situations (OOS) distort data collected from POS-Terminals or e-commerce analytics. For products under sales promotion OOS rates are up to 30%, up from the 8% background level (Corsten & Gruen, 2003). Reliable information about demand is necessary for DCM but it is not necessary to lower OOS for successful DCM, simply to extend the analytics model to account for it.

PREDICTIVE

For some, however, knowing what has happened is not good enough and companies like Jahu Vavanne, Antti PÖyhÖnen and Jani Luostariney's Nosto use analytics to make *predictive* outcomes that provide customers with a personalised shopping experience and, in turn, increase online store revenues. It's relatively new, with about two million personalised recommendations for fifteen hundred and eighty one stores across sixty-two countries, but it not only improves the shopping experience, but also generates a revenue lift of about 15% for the businesses using it.

One of the things about predictive is that the more data you have and the fresher and more salient it is, the more traction the data models and algorithms have. Individually predictive, big data, cloud and machine learning each represent important steps, but used together in a real time system there is a massive synergy.

This coordination is very difficult to achieve in an existing company or ecosystem but we started AdTotum with the idea that we could create just such a synergy by bringing the whole ecosystem into the solution. The results were dramatic. The initial aim was to provide scaleable revenue generation for quality information sites, who were having problems with pay walls and pay models, but the same principle applied to sites like Facebook and many sites across the Yahoo network.

The immediate issue was that of massive numbers of impressions with no means of monetization. Facebook was already beyond 100 Billion hits per day, but looking at the advertising quality it was clear why the current display ads could not possibly monetize a site like that properly. To put it in context, how many ads have you ever clicked on Facebook and how much value have the advertisers got from you in the time that you have used Facebook? Enough to pay for the service? That would be *most* unlikely!

Analysing the market I could see that there was a powerful group of unrelated techniques that could be put together to solve this problem effectively, creating a flow of what Gartner calls 'Business Moments'.

As Gartner says,

"Business moments are important, because they will force enterprises to rethink the role they play in a value stream. Business moments, by their very nature, illustrate a wide variety of possibilities and players and help companies envision and design new businesses that integrate people, businesses and things to do - things not possible five years ago. The trademark of a digital business will be the ability to spot these opportunities, however fleeting." (Rivera, 2014).

Predictive and the ability to harness business moments will play an important part in the next generation of digital transformations, so its worth looking at AdTotum in more detail.

AdTotum's exceptional performance lifts, architecture and different approach remove challenges in customer acquisition and publisher facing ad placement strategy that would otherwise limit expansion. The many specific challenges and barriers we can see for other ad techs' models open up even greater opportunities to AdTotum at scale.

Beyond that there are three key points in the degree of digital transformation AdTotum

makes possible:

Ordinary display ads are notoriously low return, leaving an ongoing drop in the value of impressions when advertisers actually measure ROI. Conversely Realtime Personalized Ad Systems in the AdTotum system deliver raises in ROI compared with display ads of several thousand per cent by use of hundreds of unique elements of information over tens or hundreds of millions of customer views, interacting with a product database of millions of products in real time to create a flow Business Moments.

Fully automating these and selecting them uniquely for each customer moment by moment is an optimization that delivers stunning returns without ad burn out.

AdTotum is a hybrid/Hyper-Cloud based real-time machine-learning based ad creation and optimization system creating a constant lift high enough to allow arbitrage between affiliate feeds and bulk remnant stock when sufficient purchase volume is available. There is an old Japanese saying, “From one thing, know ten thousand”, from Miyamoto Musashi[21] and by applying a unified model of machine learning and genetic algorithm models to every part of the data from real time inputs to UI and UX we achieved exactly the sort of lift and improvement that that implies.

AdTotum creates an ad ecosystem using granular insights, audience segmentation and product selection for real time creation and optimization of ads.

To do that we used sophisticated variants on multivariate analysis which control the ad display through a real time machine learning system - essentially a genetic algorithm system augmented by a sophisticated and super fast and robust variation of the multiple interlocking staircase paradigm developed in part in Cambridge University.

The genetic algorithms (GA) are artificial intelligence search heuristics that mimic the process of natural selection. This metaheuristic is used to generate useful solutions to optimization and search problems. Rather than random change the parameters are driven by highly sophisticated variants of the Bayesian and Maximum-likelihood adaptive procedures. The choice of the next parameter to be tested (or position in inference space) works differently, however: After each single user response, from the set of this and all previous stimulus/response pairs, the likelihood is calculated of where the predicted outcome lies. The point of maximum likelihood is then chosen as the best estimate for the outcome, and the next ad unit is presented with the selected parameters (and items from inference space) since a decision at that level will add the most information. In a Bayesian procedure, a prior likelihood is further included in the calculation. The technique is not dissimilar to but is significantly more sophisticated than procedures such as Quest, ML-PEST, and Kontsevich and Tyler’s method but the models used by AdTotum can have dozens or even hundreds of dimensions in the search space and the Baysian procedure is augmented by a non-parameteric statistical technique to stabilize the convergence. A significant part of this comes about from the unique Hyper-Cloud architecture.

In addition the modular API system allows us to use almost any conceivable first, second and third party online and offline data source. The genetic algorithm test system continually analyses to determine the relative weighting of these different sources for different audience clusters and product groups, attributes and items.

Most important of all what we test and optimize are very large streams of products – typically encompassing a large proportion of all available on-line products at any given time.

So while creating a campaign lift of a few per cent is very creditable for a brand, and a catalog lift of a few tens of per cent very impressive for an on-site recommendation system, we can choose a stream of personally picked products for an individual out of (effectively) all products that could be bought on-line, and adjust that in real time – a strategy that we have proven to create lifts of thousands of per cent, without burnout (as the stream continually renews and evolves).

A system like this could demand processing and storage requirements of Teraflops and Petabits but the unique and transparent Hyper-Cloud distributed architecture carries out much of the intensive number crunching over the network of millions of ad units[22] reducing central processing needs to a tiny fraction, and making it possible at a fraction of the cost.

Typically media, audience, creative and particularly product lifts can be compounded and refined on an on-going basis by the systems feeding back into display in real time (typical lag ~60 sec).

For huge markets of tens of millions of users and millions of products, this would previously have been impossible, so this makes it possible to transform both the extent to which retail as a whole can bring purchasing customers in to their digital worlds, and the extent to which publishers can fund the provision of high quality digital content and services without charging users.

CHAPTER 5: HOW?

How do you make Digital Transformation Work?

Mind-set is extremely important for digital success. One of the main strategies that the CDO can apply when planning road maps is a portfolio strategy, where a mixture of approaches are tested in parallel.

Figure 16 The secret of success is in the implementation.

In a less progressive business environment this will be interpreted as a shotgun approach or “heading off in all directions”, and the CDO may be held to account for the performance of the lowest performing of the portfolio. This is misunderstanding the purpose of the approach. A more mature understanding looks at the performance of the portfolio over a longer timescale and scans for successes that can be nurtured and grown. Decisions are not made on an arbitrary basis but on the basis of evidence and understanding of the potential of specific parts of the portfolio.

Examples of such an approach may be implementation of minimal viable products across the board in mobile, multiple social, analytics, recommender systems and apps and then assessing and tuning performance of each channel as part of an ongoing process. The great CDO will have the mindset of Edison when testing materials to create his new invention, the light bulb - his view of three years of testing before coming up with the final solution that dominated the market for nearly a century was, “I have not failed. I’ve just found 10,000 ways that won’t work.”

James Minter is quoted as saying that one of the most successful ways to start is a journey where the company says, “Right, let’s find the minimal vital products. Let’s take it to a market and see how it works in a small scale and really test it in the real world rather than contemplating about what might happen if we do that and quite when is that.” That needs a particular attitude to risk and a mandate to experiment and often, as Minter says, that involves “entrepreneurs … who tried their hand at digital startup[s] who are actually very well setup to get involved with this process … can communicate very well, [and] understand the tech and the brand.” (Baker, 2014)

Beyond that though, the biggest strategic focus and one that I’ve seen being very difficult for non-technical CEOs and product managers to absorb (and for over-narrow CTOs) is the move from products to platforms as a driving force for digital transformation.

Product managers and product oriented executives will argue that people buy products. What they need to understand is that platforms are structures that allow multiple products to be built within the same technical framework.

Companies need to invest in platforms so that future products can be developed vastly faster, more cheaply and more flexibly, than if they built them stand-alone. As time goes by the platform becomes mature and when a new product is needed it is only a few months incremental development from the platform rather than having to restart and redesign in a market where it could takes years to start from fresh.

We can also think of a platform as a business framework. Instead of making decisions technology based (“it would take years to do that”, “we are already committed to x,y,z

approach”), business decisions lead.

A platform allows multiple business models to be built and supported. For instance, Amazon is an online retail platform. Facebook is a social media platform. Apple iTunes is an online micropayment platform.

It is the business platform that leads the product strategy. Amazon started by selling books. Over time they have expanded to selling all sorts of other things. Apple iTunes started by selling tracks and now uses the same platform to sell videos, TV programmes and software applications for iPhones.

In a technical platform, you leverage the underlying technology to build new products. In a business platform, you leverage the knowledge about the customers to build new business models. Amazon built a retail platform that gathered huge amounts of data on how people buy things online. They used this knowledge to extend the platform to sell more and different things.

Of the six digital trends McKinsey asked about (Willmott, 2014), executives expected the largest share of their digital growth in the coming years to be from digital customer engagement, followed closely by the digital innovation of products, operating models, or business models.

There is a huge range of answers to this, which go far beyond a single strategy like automating the input of data. This goes beyond what a human interaction can do and we gather it over all cases and time. We call it Big Data. In the second stage of the transform we use this to understand our customers better and optimise not just to a demographic but to an individual. This is personalization. Thirdly we make our changes at every level faster than a human can respond, with new opportunities spotted not just in weeks or days but in seconds. This is the essence of dynamic environments.

HOW DO YOU GET BUY-IN FROM KEY STAKEHOLDERS.

Why is there resistance to taking these changes through to the full extent? Well, here is one way of understanding why. Imagine your ancestors as a chain of people each holding their parent's hand. You stand and hold your father or mother's hand … one generation … she holds her mother's[23] and her mother holds her mother's hand. Your parent is right next to you, your grandparent across the room, and a century of generations occupies about ten meters of human chain. It's a very simple and powerful metaphor to allow us to understand generations of time. The chain extends to the beginning of human history in a few hundred meters, to the ice ages a kilometre away. You could walk to the point a few tens of kilometres away in a day, past about ten thousand generations to a point where the members of the chain are no longer human[24] (Reich D, et al., 2010) (McDougall I, 2005), looking each ancestor in the eye along the way.

Now here is the interesting point – through most of that time, although life has changed substantially for most of us from the earliest members of the chain, very few individuals who were part of the change saw any substantial change in their life time. You can trudge hour after hour along the chain and everyone's idea of the peak of technology will be a crudely broken pebble until suddenly, in mid Palaeolithic, fire is accessible and a whole range of technologies spin off around fire, from cooking which gave access to the otherwise tough meat of grazing animals, to defence, to the ability to let your children survive a cold winter's day. Everyone before that would have told you all these things were impossible (surviving in snow, eating bison etc.); everyone after would take it for granted. So in short we were never evolved to handle the types of changes that we have to face today (Mellars, 2006).

The late Douglas Adams told me in Cambridge about that whole class of stories where a cave-man is defrosted or brought to the present technological age and much humour is derived from his inability to understand how our society works or get to grips with technology. Douglas then went on to say that that was the problem today, that we are essentially still using our ape-derived instincts (or software) to navigate around a world in which we are completely out of our depth. As he put it, we've never upgraded our software and are still using subroutines appropriate for cavemen to run our lives.

Our society is composed of cavemen whose brains haven't kept up with the complex society in which we live today. Homo Sapiens 1.0 shipped a million years ago, and - as if we hadn't mailed in our registration cards - we haven't had any updates since. Put on a desert island, how many of us could make a computer? And if computer people couldn't do it, what hope is there for the majority of people who don't understand the first thing about the technological trappings of our daily lives?

We discussed the ideas back and forth afterwards and I suggested that we do have upgrades that take us out of our purely ape-derived gut-reactions, things like logic, which the ancient Greeks had developed specifically to allow mutual resolution of differences in opinion, and mathematics, which is a tool that we use to manage and manipulate things that terrestrially evolved brains are simply not wired for. Thinking about it, Douglas pointed out that while we wisely value our positive emotions, most of us actually take great exception to using these upgrades - to trying to be logical or to believing that there

are things that mathematics can show that we can't see ourselves. We even have social constructs where we reinforce this view by regularly creating a straw man to show that emotion is better than logic – a sort of Straw Vulcan, where the writer misuses and distorts the concept of logic to create contrived examples, where what they're calling "logic" doesn't work. (Adams, 1992).

And that is why humans are really not adapted to the idea of change and life changing and why saying "plus ça change, plus c'est la même chose" seems so wise and ironic. Massive changes happen, but we don't expect them in our lifetime.

Through most of human history within a single person's lifespan very little change is ever apparent. However over these long periods of stability occasionally there are short periods of intensive change that revolutionize people's lives.

At the end of the 18th century the age-old and seemingly universal pattern was broken in Britain (Hobsbawm, 1995) (Inikori, 2002). Resources that had sat under peoples feet unrecognised for thousands of years were converted to wealth and society moved, going from hand production methods to machines, new chemical manufacturing and iron production processes, improved efficiency of water power, the increasing use of steam power, and the development of machine tools. Humankind had, for thousands of years, consisted mainly of peasants and serfs, and now suddenly had access to surplus production of material goods, food and shelter.

The story of industrialization and indeed human civilization has been one of the creation of value by allocation of specific individuals to specific trades, crafts or professions. Large organizations have moved in general from undifferentiated masses to specialists each handling a fragment of the organization's functions. Executive functions that would previously have been carried out by multi-talented individuals are now broken down into teams of specialists, and in order to co-ordinate these teams the concept of modern management has been developed.

So where is this taking us? Well, the point is that there are huge numbers of parts of a fully implemented Digital Transformation, such as algorithmic and big data type methods, that we can't necessarily grasp automatically, that we may resist as being unneeded in the context of what has gone before, and that may actually have revolutionary effects. This sort of thing happens all the time in human history and the long term changes are much bigger than you imagine.How can you be future-proof?One of the best descriptions of how companies like Amazon and Facebook have designed their core offering to be future-proof and how any company can emulate this with careful thought comes from an interview that I did with Jora Gill, Chief Digital Officer of The Economist. He described it like this

"What's happening in the disruptive world that we find ourselves in?' In digital building a five year plan or a strategy is going to be very difficult when you're constantly disrupted through new product sets. So therefore you say 'Okay, we are going to be disrupted and let's accept disruption as the new norm. Let's build our products or platforms to accept that change is inevitable.'

"So instead of building just a product that we hope will be used for five years, let's build platforms that accept disruption as a constant but also allows us to leverage that disruption. So when we see some really good CRM product, can we easily swap out our

CRM with their CRM when we see really good sort of responsive web design and how can we take advantage of responsive easily when we see the changing expectations of customers on what they want content. So they might want bite-size content, they might want a large periodical of content and the bite-size might serve them well because they find themselves in a situation where they're travelling and they want to immerse themselves in just about visit about China. What does The Economist have to say about China and when I arrive and land in China, I want to sort of show that the people that I'm talking to and experience with, I've done some background so I just want that content right now. So how can we take our content to give them what they're looking for right now or if they're immersing themselves because they want sort of a deep reading experience on a weekend. How do we give them that content? So what we find is customers are the heart of what we do and then result mapping our customer journey going "Okay, through the daily life, through the daily week, through the daily month of a customer, what do they do when they wake up from their morning, what do they do?" They want a quick snapshot of content. At lunchtime, they've got an hour, they've got a sandwich, they want to read a bit more deeper. We can, hopefully many hours, where they can really immerse themselves. So why don't we take ourselves through the customer journey and see how they want to immerse themselves content?

"On the other side is, we want to be faster market. There's a changing and disruption happening there but we still have to take advantage of that journey. So let's build platforms and then what brings all of these together is data. So data should really help us make our experimentation decisions on new products, on what the customer deems valuable. So a customer…we may think we've just created the best in the world. If the customer's not using it, our Data Ship tell us the customer's not interested in this great product that we've just built, therefore what insights can we take from that customer experience and what did they see to be interested in that product? Let's take those ideas and put them in the next product. So let's become more agile in the way we actually deliver value for what we deem as a customer. Why it's difficult to build a digital road map is because there's a constant change happening and a constant expectation from our customers so we need to keep ripping out the rulebook every six months, every year and going "Okay, that was important six months ago, to the customer but right now, it's no longer… they've topped up the pile of what they deem as the most they expect." and our data proves it. Our data tells them that they're not coming back to us as often as they were on that…So let's use that data and to say "Do another experiment. We believe the customer's most important aspect of how they consume our digital content is this and let's put it our there, let's do some ad testing on that and if we find actually, that is something of interest to our customer, let's persevere. If it's not, let's prove it and let's decide…didn't work, fail and learn and move on.

"The platform side, is. at the heart of what we do. [Our USP] is content and that content should be easily found by our front-end tools. So we need to build a content repository if you like, that's tagged cleverly. So when a customer's searching for something, it takes that tagging and builds algorithms around that tagging and allows the customer to find using taxonomies and ontologies to find the contents they're really looking for. On the other hand, a customer may say "Look, I just want to read the content." So we need to assemble content very easily. So essentially, we need to build modular content repositories

that allow us to take advantage of the immense content that we've had for many, many years. We are a company that was established in 1843. We weren't quite tagging our content back in 1843 but we still have some fantastic content. So instead of thinking of The Economist as just a magazine, it's pieces of content that you can think of as … we've got infographics, we've got videos, we've got audio and we've got the written word and if you start tagging that content, you start building products that are valuable to your customer and you're going "Okay, we never saw that." We were going down the linear root of saying "A customer's going to read our great content." but also through that tagging and building new content, we've actually seen opportunities for our customers so it's building up modular platform. On the other hand, a customer looks above the line on what they see in the apps and the web store. They're also looking below the line that they want a great experience. So customer service should be great in the digital world, CRM should be great, marketing should be great and we're not marketing them products that they're not interested in and so we have this 360 view of below the line of what the customers want and above the line. So we want to take advantage of great CRM systems, great marketing systems but we don't necessarily want to build those. So we want to be able to integrate those great systems into our architecture very easily and then when those systems aren't cutting-edge or aren't what we believe is the best agreed road map, we want to be able to remove them instantly and integrate new form. So the platforms I'm talking about are moving away from A, making us competitive advantage for us in building great content and delivering that great content to the customers but we also want to take the competitive advantage of what others do in the CRM space, the marketing space and be able to plug in those great tools into our systems until we feel that they've lost their competitive energy and somebody else is doing that so much better. So it is that…what would I call it, that…what's the word…lean enablement of our architecture where architecture stops being a journey where you have to land so you know, architecture has this as this 2b but we don't know what this 2b is. So what we really want is an enablement and evolving architecture, that's the word. We want an architecture that allows us to evolve and doesn't hamper us from creating that great experience or taking advantage of others who are creating great products." (Baker, 2014)

HOW DOES A TRANSFORMATION WORK? A BLUEPRINT.

Details vary from transformation to transformation and organization to organization, but broadly speaking, from my research across dozens of transformations and interviews of leading Chief Digital Officers, successful transformations have a lot in common.

HOW: STAGE I. PRELIMINARY REPORT.

The Chief Digital Officer spends approximately 2-5 days in the role of transformation consultant identifying key stakeholders and interviewing them to identify the possible goals and scope of a transformation. A short preliminary report is presented to the CEO and to the board outlining findings.

HOW: STAGE II. TRANSFORMATION INFORMATION GATHERING[25].

Typically there is a period of 30-90 days in which the Chief Digital Officer gathers key data in depth. Typically this information is primarily obtained from stakeholders and internal sources but it is often highly effective for the Chief Digital Officer to implement advanced analytics and customer surveys to obtain independent data, and there needs to be full organizational buy-in to this approach.

At this stage there needs to be a board or CEO level mandate which gives the CDO priority to schedule one-to-one and group meetings with all key decision makers, a suitable budget for administration and if necessary travel. The CDO needs to report directly either to the board or to the CEO. Reporting to, say, the SVP of information services makes no sense and no real transform is likely to be achieved.

HOW: STAGE III. TRANSFORMATION ANALYSIS & GLOBAL REQUIREMENTS[26].

Typically it takes about 30 days to complete the analysis and the initial recommendations and global requirements audit. All Digital Transformation projects share certain core or global requirements and goals. These lie above the level of specific requirements, in as much as, if they are not applied the effectiveness of the whole organization or business will be impacted throughout its life. These are not always obvious to the non-expert and are typically considered as secondary or details.

In particular, it is at this stage that we determine scope and create a global mandate. It answers the question “What will the Digital Transformation Cover”. We can accept that in the first instance the plan will only cover parts of the mandate up to a specific planning horizon or budget, but only once this stage is signed off do we move on to more specific requirements and planning.

HOW: STAGE IV. CREATING BUSINESS PROCESS DOCUMENTATION & THE TRANSFORMATION TEAM[27].

The Chief Digital Officer should by this stage publically present the plan to all stakeholders and continue with stakeholder interviews and weekly meetings while creating the business process documentation. It’s important for the Chief Digital Officer to retain the strategic focus of high level staff, making them think of where they are actually aiming to go and to avoid Parkinson’s law of triviality, also known as bike-shedding, the bike-shed effect, or the bicycle-shed. In 1957 C. Northcote Parkinson argued that organizations give disproportionate weight to trivial issues. Parkinson observed and illustrated that a

committee whose job is to approve plans for a nuclear power plant spent the majority of its time with pointless discussions on relatively trivial and unimportant but easy-to-grasp issues, such as what materials to use for the staff bike-shed, while neglecting the less-trivial proposed design of the nuclear power plant itself, which is far more important but also a far more difficult and complex task to criticize constructively. It is highly prevalent in large scope transformation projects and the law has been applied to software development (Kamp, 1999) and other activities. The term “bike-shedding” was coined as a metaphor to illuminate Parkinson’s Law of Triviality and was popularized in the Berkeley Software Distribution community.

By this stage the Chief Digital Officer should be allowed to build a transformation team who will be direct reports to the CDO, with clearly defined time allocated to the transformation through the CDO and not through anyone else. This whole process can take between a few days and a few weeks depending on the company culture, resources and task complexity.

HOW: STAGE V. CREATING THE TRANSFORMATION ROAD MAP AND BUDGET[28].

At this stage we create short and long term road maps.

Create short term and long term road maps.

It is likely that for most stakeholders a visionary, long term roadmap will seem irrelevant to short term planning. However without a long term road map, which the CDO and CEO or board take ownership of, short term changes are likely to head towards a local optimum rather than a transformational goal. Considering Blockbuster’s and Borders’ digital strategies gives good examples of that.

GET STAKEHOLDER BUY-IN FOR METHODOLOGY

Digital Transformation projects are unlikely to use a waterfall methodology. Agile methods like SCRUM[29] are popular, but from the perspective of the CDO and digital transformation SCRUM is essentially a tactical initiative rather than a strategic one and highly subject to unaccountable over-runs in time and budget when used in the domain of digital transformation. Using DSDM[30] at a high level and SCRUM for any sub-teams overcomes these limitations (and the newer DOVES) and is extremely effective where the priority is delivery, or a transformation on time and on budget.[31] At this stage it is important for the stakeholders and in particular the CEO and board to fully understand how the chosen methodology works from their perspective and what it will deliver, and to give buy-in for use of that method. For example, if getting the main agreed targets complete within the agreed time and budgets is important and DSDM is agreed on then stakeholders have to understand that feature drift is not an option within the budget period. In DSDM, slippage being absorbed by removing optional features and changes, these are added after the agreed delivery date and budget.

If regular changes in direction and new features need to be added at any time then SCRUM without DSDM is better suited, but the CDO can no longer be held to account for the original budget and timeline.

As part of that buy-in it is essential for success to confirm on the programme management check list that nine instrumental factors are met.

Acceptance of the DSDM philosophy before starting work. Or acceptance that:

the project will be carried out under agile management.

that (for example) DSDM or DOVES has been chosen to prioritize budget and delivery times (on time and on budget) with:

- Appropriate empowerment of the Transformation Team.
- Commitment of senior business management to provide the necessary C-level and Board Level involvement.
- That delivery will be incremental.
- That the Transformation Team will have full access to business roles.
- Transformation Team Stability. The team will have a suitable environment to plan, execute and review the transformation. For example members will not be removed from the team or assigned to other duties during the project.
- Transformation Team Skills. The Chief Digital Officer needs to have access, internally or externally, to the skill sets that are needed to complete the transformation over the appropriate time windows.
- Transformation Team Size. Adequate resources are needed and the ability to change them if blockers are present.
- A supportive commercial relationship for the Transformation. A suitable budget must be made available.
- Create budgets for transformation

Having done the first steps of creating short term and long term road maps and getting

stakeholder buy-in for methodology, the essential task of creating budgets for transformation needs to be carried out in association with the CEO and CFO. Transformation should not progress until these are fully signed off.

HOW: STAGE VI. IMPLEMENTATION OF THE TRANSFORMATION

During implementation the road map will guide the process, but there may still be an ongoing elicitation of specific requirements[32]. These are always at the output layer – the stakeholder says what they want in functionality – not what technology or product they want integrated, although guidance is always valuable. As an example of specific requirements, part of the mandate of transformation will often include specification of UI and will almost certainly subsume UX. Minimalist interfaces reduce cognitive load and increase operator bandwidth and are therefore favoured. This might seem fairly obvious as a statement, but the implications are seldom properly explored. Hidden interface components are not minimalist. They INCREASE the user's cognitive load and so are essentially stylistic embellishments. Hiding a set of functions that are key to user's operation of the system greatly increases user's cognitive load.

Through each step the CDO and team will analyse requirements determining whether the stated requirements are clear, complete, consistent and unambiguous, and resolving any apparent conflicts. In Digital Transformation there is a substantial step where requirements are identified by functional and algorithmic class to allow future expandability and cruft-free development – significantly reducing long term costs, improving functionality and improving reliability and software life. Cruft is the software term for anything that is left over, redundant and getting in the way. It is used particularly for superseded, useless, superfluous or dysfunctional elements in computer software, which are typically introduced during poor specification or lack of design-stage identification of all classes of activity that the software will perform.

A transformation team member will be responsible for recording and take ownership of reporting on requirements. Requirements may be documented in various forms, usually including a summary list and may include natural-language documents, use cases, user stories, or process specifications.

It's important to recognise that requirements analysis can be a long and tiring process during which many delicate psychological skills are involved. New systems change the environment and relationships between people, so it is important to identify all the stakeholders, take into account all their needs and ensure they understand the implications of the new systems. Analysts can employ several techniques to elicit the requirements from the customer. These may include the development of scenarios (represented as user stories in agile methods), the identification of use cases, the use of workplace observation or ethnography, holding interviews, or focus groups (more aptly named in this context as requirements workshops, or requirements review sessions) and creating requirements lists. Prototyping may be used to develop an example system that can be demonstrated to stakeholders. Where necessary, the analyst will employ a combination of these methods to establish the exact requirements of the stakeholders, so that a system that meets the business needs is produced. Requirements quality can be improved through these and other methods.

A separate team member should be responsible for visualization of outcomes, using tools that promote better understanding of the desired end-product, such as visualization and simulation.

The team will need to understand system and dependence APIs and to use consistent reporting templates, producing a consistent set of models and templates to document every process.

OTHER ELEMENTS

There are a whole mixture of resources that can be used at the “How” stage. I’m going to look over them here. It’s worth noting that this is not a comprehensive list, nor are all these components must-haves, but it does help to understand these in order to understand what the process will be.

Identification of Stakeholders

Starting at the earliest stages it is important to identify the key stakeholders. Each transformation will have a different set of stakeholders.

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Stakeholder interviews

Stakeholder interviews are a common technique used in requirements analysis. They are generally focused on the perspectives and perceived needs of the stakeholder which gives a general advantage of obtaining a much richer understanding of the stakeholder’s unique business processes, decision-relevant business rules, and perceived needs. It is not necessary to obtain full buy-in from all stakeholders, but key advocates from each set of stakeholders will aid the process, and careful listening to, and documenting objections from, negative stakeholders and blockers is important too.

Consequently this technique can serve as a means of obtaining the highly focused knowledge that is often not elicited in Joint Requirements Development sessions, where the stakeholder’s attention is compelled to assume a more cross-functional context, and the desire to avoid controversy may limit the stakeholder’s willingness to contribute. Moreover, the in-person nature of the interviews provides a more relaxed environment where lines of thought may be explored at length.

Joint Requirements Development (JRD) Sessions

A formal JRD is not always necessary in a transformation, but there is a need to handle requirements that have cross-functional implications that are unknown to individual stakeholders and often missed or incompletely defined during stakeholder interviews. These cross-functional implications can be elicited by conducting JRD sessions in a controlled environment, wherein stakeholders participate in discussions to elicit requirements, analyze their details and uncover cross-functional implications. It’s most effective to record and transcribe sessions rather than taking notes or having a dedicated scribe to document the discussion. Processes like JRD Sessions, JAD Session (Joint Application Design Sessions) and Contract-style requirement lists need not be formally processed although some CDOs may use them as part of the process. A more suitable alternative to the requirement lists is agile user stories to suggest requirement in every day language.

Where stakeholders have extensive “shopping lists” of requirements best practice takes the composed list of requirements merely as clues and repeatedly asks “why?” until the actual business purposes are discovered. Stakeholders and developers can then devise tests to measure what level of each goal has been achieved thus far. Such measurable goals change more slowly than the long list of specific but unmeasured requirements. Once a small set of critical, measured goals has been established, rapid prototyping and short iterative development phases may proceed to deliver actual stakeholder value long before the project is half over.

Prototypes can be constructed where buy-in or approval is required, but in general the CDO should not be operating at that level of mandate and should be more empowered. A prototype is a computer program that exhibits a part of the properties of another computer program, allowing users to visualize an application that has not yet been constructed. A popular form of prototype is a mock-up, which helps future users and other stakeholders to get an idea of what the system will look like. However, prototypes make it easier to make design decisions, because aspects of the application can be seen and shared before the application is built. Major improvements in communication between users and developers are often seen with the introduction of prototypes. Early views of applications lead to fewer changes later and hence reduce overall costs considerably.

Prototypes can be flat diagrams (often referred to as wireframes) or working applications using synthesized functionality. Wireframes are made in a variety of graphic design documents, and often remove all color from the design (i.e. use a greyscale color palette) in instances where the final software is expected to have graphic design applied to it. This helps to prevent confusion as to whether the prototype represents the final visual look and feel of the application.

Another useful tool is the use case. A use case is a structure for documenting the functional requirements for a system, usually involving software, whether that is new or being changed. Each use case provides a set of scenarios that convey how the system should interact with a human user or another system, to achieve a specific business goal. Use cases typically avoid technical jargon, preferring instead the language of the end-user or domain expert. Use cases are often co-authored by requirements engineers and stakeholders.

Use cases are deceptively simple tools for describing the behavior of software or systems. A use case contains a textual description of the ways in which users are intended to work with the software or system. Use cases should not describe internal workings of the system, nor should they explain how the system will be implemented. Instead, they show the steps needed to perform a task.

Software requirements Outline

The CDO is operating in a more agile flexible environment but having internal assessment of requirements is valuable. Consideration of a number of operational requirements will scope out basic needs and so are listed here.

Operational distribution or deployment: Where will the system be used? This needs to remain flexible and for platform development we need to ask the related question “where can it be used”.

Mission profile or scenario: How will the system accomplish its mission objective?

Performance and related parameters: What are the critical system parameters to accomplish the mission?

Utilization environments: How are the various system components to be used?

Effectiveness requirements: How effective or efficient must the system be in performing its mission to be a minimum viable product?

Operational life cycle: How long will the system be in use? In digital transformation consideration needs to be given of a span of life from “when will we have enough data to know if we need to redesign, pivot or terminate the project” up to “how long could the code being written now remain in operation in the worst case (for code life)”.

Environment: In what environments will the system be expected to operate in an effective manner? In particular what are the boundaries that will affect business performance and UX? These may relate to environment scale.

Architectural Requirements

Architectural requirements explain what has to be done by identifying the necessary system architecture of the platform. Note that platform architecture is critical, but individual products can be minimum viable products and be improved by iterations so long as they don’t impact the platform.

Structural Requirements

Structural requirements explain what has to be done by identifying the necessary structure of the platform.

Behavioral Requirements

Behavioral requirements explain what has to be done by identifying the necessary behavior of the platform.

Functional Requirements

Functional requirements explain what has to be done by identifying the necessary tasks, actions or activities that the platform may need to deliver over its lifetime.

Non-functional Requirements

Non-functional requirements are requirements that specify criteria that can be used to judge the operation of a system, rather than specific behaviors.

Performance Requirements

The extent to which a mission or function must be executed, generally measured in terms of quantity, quality, coverage, timeliness or readiness. During requirements analysis, performance (how well does it have to be done) requirements will be interactively developed across all identified functions based on system life cycle factors, and characterized in terms of the degree of certainty in their estimate, the degree of criticality to system success, and their relationship to other requirements.

Design Requirements

The “build to,” “code to,” and “buy to” requirements for products and “how to execute” requirements for processes expressed in technical data packages and technical manuals.

Derived Requirements

Requirements that are implied or transformed from higher-level requirement. For example, a requirement for seamless user experience in navigation of an interface may result in a design requirement for low latency of response for user interactions.

Allocated Requirements

A requirement that is established by dividing or otherwise allocating a high-level requirement into multiple lower-level requirements. Example: A specification for 200 millisecond response time in a system that consists of two subsystems might result in weight requirements of 70 millisecond and 130 millisecond for the two lower-level items.

Cutting through the processes another way, I talked to David Cook, Chief Digital Officer for Time Out[33]. He described a journey where he says “it probably took us a few months to agree what the grand vision was. We wanted to challenge every preconception about the sort of growth that was achievable and set ourselves some big, hairy audacious goals. Rather than talking about expanding into 80 cities, we started talking about 800.” I asked him how he sold that internally and he explained how he devised a new operating model, a modular self contained expansion process for the digital version of his previously print only magazine. To grow the company over an order of magnitude[34] he developed “something we call ‘Time Out in a Box’, which described in practical terms how we could expand efficiently and keep costs low; the good news is that we’re already seeing it come to fruition. Having a plan is one thing, but seeing it work really gets everybody aligned and behind the vision.” (Baker, 2014)

Requirements analysis issues

“If I had asked people what they wanted, they would have said faster horses.” Henry Ford

Stakeholder issues

Steve McConnell, in his book Rapid Development, details a number of ways users can inhibit requirements gathering. It is the Chief Digital Officer’s job to overcome these ahead of time although sometimes it will seem as though they are over-riding the stakeholder, and CEOs may be inclined to try to over-ride the global digital strategy to put in a plan that seems to fit short term specific needs more closely.

Users do not understand what they want or users don’t have a clear idea of their requirements. Typically they are answering short term questions or looking at short term requirements and expecting longer term ones to be solved as they come up. This is analogous to navigating without a map, simply deciding at each junction what seems best at the time.

Users will not commit to a set of written requirements. Typically they want to have the ability to add specifics rather than accept design that will allow categorical additions that may include those specifics.

Users insist on new requirements after the cost and schedule have been fixed.

Communication with users is slow.

Users often do not participate in reviews or are incapable of doing so.

Users are technically unsophisticated. This is fine so long as they do not attempt to influence technical design. In one organization where I worked the product manager was unable to understand the concept of cryptographic hash functions – which was fine – until he systematically started deleting architectural design that would have allowed key security and anonymity functionality that was to be a platform USP – but that he believed was impossible.

Users do not understand the development process.

Users do not know about present technology.

This may lead to the situation where user requirements keep changing even when system or product development has been started.

Engineer/developer issues

Possible problems caused by engineers and developers during requirements analysis, but resolved due to having a fully empowered Chief Digital Officer are:

Engineer/developer starts coding/implementation immediately before they really understand the whole requirement from the analyst, which usually causes lots of defect fixing or reworking in the test/verification phase: This is fundamental. No core code can be written until the Chief Digital Officer creates (or leads creation) of the architecture. This is also why a proper project management framework needs to be in place.

Technical personnel and end-users may have different vocabularies. Consequently, they may wrongly believe they are in perfect agreement until the finished product is supplied.

Engineers and developers may try to make the requirements fit an existing system or model, rather than develop a system specific to the needs of the client. The top down, bottom up model outlined here prevents this.

Analysis may often be carried out by engineers or programmers, rather than personnel with the domain knowledge to understand a client's needs properly.

Attempted solutions

One attempted solution to communications problems has been to employ specialists in business or system analysis.

Techniques introduced in the 1990s like prototyping, Unified Modelling Language (UML), use cases, and Agile software development are also intended as solutions to problems encountered with previous methods.

Also, a new class of application simulation or application definition tools have entered the market. These tools are designed to bridge the communication gap between business users and the IT organization — and also to allow applications to be 'test marketed' before any code is produced. The best of these tools offer:

Wireframes and flow charts to sketch application flows and test alternatives

Ability to capture business logic and data needs

Ability to generate high fidelity prototypes that closely imitate the final application

Interactivity

Capability to add contextual requirements and other comments

Ability for remote and distributed users to run and interact with the simulation

Starting the process

Having said this, digital transformation needs to match the needs of the stakeholders and it is important to start the process in each case with Needs analysis.

Needs analysis

Needs analysis is the formal process that sits alongside Requirements analysis and focuses on the human elements of the requirements (Smith, 2011).

User-centred design, according to Katz-Haas, is really about defining who the users are, defining their tasks and goals, their experience levels, what functions they want and need from a system, what information they want and need and understanding how the users think the system should work. User-centred design has also been linked to the identification of required job performance skills, the assessment of prospective trainees' skills and the development of objectives.

The first step in any user centred design process is to understand the users' needs.

Put simply, whereas Requirements analysis focuses on the elements needed to be represented in the system, needs analysis focuses on the requirements related to the goals, aspirations and needs of the users and/or the user community and feeds them into the system requirement analysis process. The main purpose of needs analysis is the users' satisfaction.

As it focuses on the needs of the human, needs analysis is not limited to addressing the requirements of just software, but can be applied to any domain, such as automotive, consumer product, or services such as banking. Although it is not a business development tool, it can be used to help in the development of a business case.

We can identify the customers' needs in three ways:

Client request

Modification of an existing design

Generation of new product

Underlying principles of needs analysis are listed here:

User's need based requirements are complex and can conflict

User's need based requirements build a bridge from the business case to the design

User's need based requirements help to identify trade-offs that need to happen in the design process (i.e. where a design cannot resolve the user's need-based requirement conflicts)

User's need based requirements are there to unify the multi-disciplinary design team,

enabling them to meet their business case.

Formulate and ask questions to do with the business plan that provide an indication of the human aspects of the system, including the relative merit of functionality.

Always express these findings from the user's perspective.

Cross-relate these requirements to each other and to the impactors on the activity.

Allocate sufficient time during the development process to check and validate your user's need based requirements.

Ensure that all user's need based requirements are derived as low level user requirements before being transposed into system requirements.

Word your requirements precisely and ensure that you cover all categories of human-related requirements.

Create test statements to validate the user's need based requirements, the concept and the implementation.

Prior to freezing your design, validate your user's need based requirements with users.

Accept that there still may be contradictory requirements.

Understand the nuances of the requirements and ensure that these are reflected in the precise wording of the requirements.

Keep asking your users until you have a true understanding of their requirements.

Elegant design can only be created from understanding the nuances of the requirements:

Usability

Human factors

Task analysis

User-centred design

Human factors integration

Requirements analysis

Training needs analysis

Needs assessment

Requirements analysis

Requirements analysis looks at the problem from a systems engineering perspective. Although it is valuable to have requirements analysts involved through the needs analysis phase, generally requirements analysis should be formed by the output of *needs analysis*.

Requirements analysis, in systems engineering and software engineering, encompasses those tasks that go into determining the needs or conditions to meet for a new or altered product, taking account of the possibly conflicting requirements of the various stakeholders, analyzing, documenting, validating and managing software or system requirements.

Requirements analysis is critical to the success of a systems or software project. The requirements should be documented, actionable, measurable, testable, traceable, related to identified business needs or opportunities, and defined to a level of detail sufficient for system design (Alain Abran & Pierre Bourque, 2005).

The core activities of requirements analysis are:

Requirements Specification

Architecture Construction

Design

Testing

Debugging

Deployment

Maintenance

A typical breakdown of these activities is included at the end of this volume[i].

A range of methodologies can be applied[35] but in general Waterfall methods[36] tend to have a long non-iterative loop that lacks the flexibility required for Digital Transformation. Spiral Project Management tends to create difficulties in meeting budgetary and scheduling requirements.

As Christian Purser, Chief Digital Officer for M&C Saatchi told me when I interviewed him:

“I feel sorry for the people that I have to do the full lifespan thing upfront. What a responsibility, to get it right in a single go after just a few months of talking to people about how things work. That’s a tough gig! Maybe I should count myself very lucky that I get to evolve an organization inside out, rather than transforming it outside in.”

If we go back to the fundamentals of Digital Transformation and remember about local optima, we can see that all of these models and the alternative Incremental and Prototype Models also have a tendency to get stuck in local peaks or local optima, where planned solutions converge on short or medium term goals effectively, but miss the longer term strategic goals[37].

In contrast a digital strategy that identifies the location of these goals can populate a number of local maxima using small agile teams and build multiple bases down from there. Requirements analysis needs to see and understand the big picture even if implementation is in small steps.

How to use Big Data as a game changer.

The story of big data is that the fine grained data which could be useful to understanding some small part of a business, such as digital footprints[38], and which would previously have been discarded for larger analysis, is now useable as part of the business’s whole story, giving a deeper understanding of the business processes. This is not just analytic, but can be used to dynamically change the site for an individual customer in the example

of a retail environment.

How big is BIG?

Big Data concerns large-volume, complex, growing data sets with multiple, autonomous sources. There is a lot of mystique and hype in the field but essentially what we define as big data depends on the field and era of the data. You might consider that there are two steps in this – data sets that are not easy to visualise as a human being and those which are not manageable and manipulatable with an off the shelf computer system.

Data sets that are not easy to visualise as a human being might just consist of graphs of large scientific studies (in say the field of cancer research), maybe a few hundred separate case studies or experiments, viewed simultaneously, and might be processed using Matlab[39] to create heat maps[40], 3-D surface plots or maps or 4-D animations of data surfaces.

Data sets which are not readily manageable with a single off the shelf computer or software might include medical records or sales or browsing habits of a few million users over a few thousand products or tests over a prolonged period of time, and can easily occupy Terabytes, Petabyte or Exabytes where one Terabyte equals 1024 Gigabytes, one Petabyte equals 1024 Terabytes and one Exabyte equals 1024 Petabytes. At the time of writing – 2014 – desktop computers and small servers can store Terabytes of data while Petabytes occupy one or more large server racks and Exabytes require a warehouse of thousands of servers.

To get a feeling of size:

Terabytes:

Wikipedia consists of a 5.87 terabyte SQL dataset.

The content of the Library of Congress is commonly estimated to hold 10 terabytes of data in printed material.

According to DNAnexus Founder and CEO Andreas Sundquist a fully sequenced human genome results in about 1TB by the time the genome has been analyzed.

Petabytes

Yahoo stores 2 petabytes of data on behavior, 15% of the whole internet.

Walmart handles more than 1 million customer transactions every hour, which is imported into databases estimated to contain more than 2.5 petabytes (2560 terabytes) of data.

The total size of the Internet in the archive.org Internet archive in 2014 was 15 Petabytes.

Experiments in the Large Hadron Collider produce 15 Petabytes of data each year.

The content of the Library of Congress is commonly estimated to hold 20 petabytes of data including audio, video, and digital materials.

Facebook’s Hadoop clusters include the largest single HDFS cluster known, with more than 100 PB physical disk space in a single HDFS file system.

eBay.com uses two data warehouses at 7.5 petabytes and 40PB as well as a 40PB Hadoop cluster for search, consumer recommendations, and merchandising.

Exabytes

Cliff Reid, CEO of Complete Genomics, sees sequencing human genomes as a brute force computational problem that is best overcome through large scale centralization and is aiming for a database of one million human genomes with a size of one Exabyte.

International Data Corporation estimates that approximately 160 exabytes of digital information were created, captured, and replicated worldwide in 2006. Research from University of Southern California estimates the amount of data stored in the world by 2007 as 295 exabytes and the amount of information shared on two-way communications technology, such as cell phones, in 2007 as 65 exabytes, although all of these are basically swamped by digitalized audio and video streams rather than the core information content.

Big data sets are not just big though – because of Moore's Law as well as growth of number of data inputs it is growing exponentially with IBM claiming that 90 per cent of the data in the world today were produced within the past two years. Because of this data has exponential growth, both structured and unstructured.

Real world data is typically not just large in volume, but is also heterogeneous, with autonomous sources each with distributed and decentralized control. The data scientist seeks to explore complex and evolving relationships among data. The modelling term to cover these relationships is HACE: Heterogeneous, Autonomous, Complex, Evolving (X Wu, 2014).

Something that Big Data and Algorithm people typically are not experienced in and tend to overlook is the issue of data quality. Much of the data scientist's work is handcrafted — what data scientists call "data wrangling," "data munging" and "data janitor work" is still required. Data scientists typically spend from 50 per cent to 80 per cent of their time mired in this more mundane labor of collecting and preparing unruly digital data before it can be used, and what's more both the quality and validity of processing and analysis is often massively reduced by the bottlenecks that this creates.

In my own experience data quality is second only to data accessibility in dramatically reducing the impact of big data and holding back digital transformation in organizations – even in programmer or techie led "data companies".

The culprit is often lack of forethought or planning, programmers and management lacking a strategic technical overview and keen to implement as a first priority, scorning or simply not understanding the need for long term data planning. Strategic data planning roadmaps designed to eliminate these problems over the long term are put off or even left unread while the company locks in problems that will block growth and be a destructive cancer over the coming years, in order to implement plans based on resolution of short term problems or customers' wish lists for the next quarter.

Figure 17 The popular view at present among data scientists is that algorithms are pivotal to success. Here we illustrate the principle that they are part of the chain.

The popular belief is that you can send an algorithm over raw data and have insights pop up. Typically problems arise as new data tables are added *ad hoc* or even at each agile sprint, and as new analyses are created without any backward compatibility - "we couldn't have known we needed them ahead of time". The excuse shows poor competence as nothing was preventing an expandable structure being designed at the first instance except the philosophy "we didn't know that we would ever have to change". The chance to analyse huge, valuable archives of historical data are dismissed with the mantra "it's not that simple" when what was really meant was "I didn't think ahead" or worse "I refused to think ahead".

You can use software to clean the data, but the situation is analogous to signal to noise in an audio system and so, just as in hard science, the real solution is to design things so that

you get clean data from the start. GIGO counts more in big data than ever before[41]. Having to use data cleaning of any sort means that you have put the wrong figures in. The only acceptable solution is to put the right ones in. Any technological fix is worse than a kludge[42], it is a bodge.

On two occasions I have been asked, “Pray, Mr. Babbage, if you put into the machine wrong figures, will the right answers come out?” … I am not able rightly to apprehend the kind of confusion of ideas that could provoke such a question.

Charles Babbage, Passages from the Life of a Philosopher

Monica Rogati, vice president for data science at Jawbone, gives us an idea of how big and widespread the problem is when she says that “Data wrangling is a huge — and surprisingly so — part of the job,” going on to say “It’s something that is not appreciated by data civilians. At times, it feels like everything we do.”

The magnitude of the problem is re-iterated. “It’s an absolute myth that you can send an algorithm over raw data and have insights pop up,” said Jeffrey Heer, a professor of computer science at the University of Washington and a co-founder of Trifacta, a start-up based in San Francisco.

Big data typically has to operate over a parallel network to allow adequate storage and processing ability. The most common current method to implement this is a Cloud architecture. A Chief Digital Officer needs to have a good understanding of parallel data systems and of at least one scalable cloud platform. In contrast to more traditional, low-level High Performance models that interact with parallel and distributed hardware, such as OpenMP for shared memory and MPI for distributed memory systems, users typically interact with the cloud at a higher level using tools such as Hadoop or the implementation of server farms. The more obvious trade-off for these scenarios is the loss in efficiency or flexibility for gains in usability. A more implicit trade-off is the lack of communication possibilities for interaction between different processing units as the program is deployed. This implies that cloud computing is inherently biased towards applications that are highly parallel scenarios, which require a minimal interaction between processing components. While traditionally these are easiest to implement from a parallel viewpoint and are a good fit for most business applications, they are not always a good match for data scientific applications, which often require a more rigorous communication scheme unless carefully designed.

The dominant practical issues regarding using Cloud Computing are interoperability, moving data to the cloud, and portability. Interoperability between clouds, in the sense of communication between them, is currently a major issue although application of the correct data architecture applied at a strategic level can aid this.

Although multiple independent APIs exist for interacting with current cloud offerings, by their nature these unique APIs are a barrier to cloud users who wish to combine the functionality of multiple clouds in order to provide new services. Pending standardization of cloud interfaces, creation of data exchange layers to mitigate the problem.

Moving data to a cloud can be problematic in the case of Public Clouds if the cloud is only used for storage and not processing. Questions regarding how to quickly transfer data to

the cloud in a secure fashion are still very relevant. This is especially a concern when using a cloud for Big Data analysis, and serves as a bottle neck for timely analysis of data when volume is an important factor for the data being analyzed. To illustrate this problem, consider a data set which is 20 Terabytes in size. If we were to move this data to a cloud provider using a connection which supports up to 5 Mb/s this would take approximately a year.

Portability can vary depending on the service model that is in use. For the enterprise user of bespoke solutions using IaaS, moving a virtual machine from one cloud provider might be a suitable level of portability perhaps when moving from multi-tenant cloud infrastructure to single-tenant bare-metal servers[43].

One of the advantages of the cloud is its scalability. The illusion of unlimited resources through the use of resource elasticity and on-demand self service provides a highly scalable environment. This scalable environment can be leveraged for data storage and analysis. In addition, no upfront costs are required for public cloud users as the infrastructure is completely managed by the cloud provider. Concerns of over-provisioning from the perspective of the cloud user are eliminated when using cloud services due to the on demand nature of public clouds, while data and analysis results can be easily shared among groups of users or organizations.

Multiple tenants are sharing physical resources opens up opportunities for side channel attacks but intelligently designed architecture can all but eliminate these for the majority of users. The costs associated with transferring data and communication with the cloud can also likewise be mitigated. Using OpenStack leads to a reduction of the wide range of APIs which are in use by multiple clouds saving a significant amount of time devoted to either learning how to interface with these clouds or building interconnectivity tools. (Branch, 2014)

Testing and Analysing Predictions

Large errors in flu prediction were largely avoidable, which offers lessons for the use of big data. Google Flu Trends (GFT) made headlines but not for a reason that Google executives or the creators of the flu tracking system would have hoped. Nature reported that GFT was predicting more than double the proportion of doctor visits for influenza-like illness (ILI) than the Centers for Disease Control and Prevention (CDC), which bases its estimates on surveillance reports from laboratories across the United States. This happened despite the fact that GFT was built to predict CDC reports.

Analysis at Harvard University of the issues identify “Big data hubris” is the often implicit assumption that big data are a substitute for, rather than a supplement to, traditional data collection and analysis. They assert that there are enormous scientific possibilities in big data. However, quantity of data does not mean that one can ignore foundational issues of measurement, construct validity and reliability, and dependencies among data and identify the issue that core challenge is that most big data that have received popular attention are not the output of processes able to produce valid and reliable analysis (Lazer, 2014). In summary you need to be more than just a self-professed hacker, database expert or a statistician to create tools that allow valid inferences from big data.

Digital Transformation with Big Data

Once clean, valid data has been extracted, the challenge is not just to get these down to manageable graphs or information panels although given that the true information processing rate of incoming information in humans is typically just a few bytes a second after interpretation has occurred (Scott-Brown, Baker, & Orbach, 2000) this is highly important. Ultimately the higher challenge is to extract actionable information and valid conclusions that can be used to input into control processes that may become fully automatized during the digital transformation process.

Thus for the first forty years or so of motoring cars had a little lever to set the ignition timing by hand as you drove along to adjust between a setting that gave feeble power, noise and high pollution to the other extreme that quickly destroyed the engine. Later on advanced cars had a dial that showed the driver manifold vacuum – like a business control panel combining measurements to let the user make decisions in a skilled way. Shortly after, though, that information was used to directly set the ignition timing throughout the engine's RPM and load range hundreds of times a second so that today non-one thinks of manual ignition timing Justas tomorrow there will be innumerable business functions that can be optimised in the same way. Let's just remember Whitehead's words again about "advances [being] by extending the number of important operations which we can perform without thinking of them." That's what we are aiming for in digital transformation and we see that nowhere more than big data where thousands of factors and trillions of pieces of data can ultimate be combined together to form part of the automated functions of the company.

The ideal goal is not to have hundreds of new data metrics in the future with every manager having to become a quant (although there may be an intermediate stage a little like this is managers prefer it), but rather to automate business processes in a far better and more informed way.

Personalization

Respondents to McKinsey's 2014 survey (Willmott, 2014) ranked digital customer engagement as a top strategic priority and reported that current spending patterns mirror digital priorities. The question is how do you actually achieve than. There are a number of ways, but if implemented correctly these all depend on the concept of personalization.

19th and 20th Century businesses were characterized by mass production and mass markets and a move away from personal service, just as the history warfare was characterized by the ability to concentrate manpower and make it operate like a massive inflexible machine. Unstructured groups of warriors, depending on personal strength and combat skill were swept away by Greek Phalanxes and Roman Legions who created a system which allowed thousands of ordinary people to get together to form an unstoppable military machine that could crush any elite warrior who charged forwards. Loosely organized knights were in time supplanted by tightly packed, massed Dragoons and Cavalry whose discipline allowed them to field armies of tens of thousands instead of mere hundreds.

The trend continued until by the first world war it was blindingly obvious to Generals that the only response to deadlock was to make a massed attack with densely packed soldiers shoulder to shoulder marching slowly and machine-like towards the waiting machine

guns.

The response of traditional industry like the Detroit auto industry to a changing world was similar, as it will be by companies who dismiss digital transformation and simply see it as an add on to the existing business model.

Transformational Solutions that allowed previously physical based products or transactions to be sold or traded digitally.

We worked out a lot of the basic principles that are beginning to be seen across the board in digital transformation in the mid 1990s for Perimele's Pay2See digital payment platform. Pay2See had a very prominent placing in the UK computer press and across a large number of on-line retailers. The aim was to provide a universal B2C/C2C/B2B digital sales management platform. It featured state of the art encryption, file compression, micropayments and one click shopping

And was originally written for a project with the Anglo-Dutch multinational publishing and information company Reed Elsevier.

Pay2See's development was the product of a two-phase strategy: "First, Pay2See focused on expanding its service among web site owners wanting to sell digital content in the US. Second, Pay2See was offered as a payment and content delivery platform worldwide.

First generation digital sales.

In the first phase, payment volumes were coming mostly from sellers of music, books and technical materials.

The rational was that anyone with internet access could publish anything digital disintermediating publishing by removal of intermediaries in a supply chain, or "cutting out the middlemen". Instead of going through traditional distribution channels, which had some type of intermediate, creative would be able now deal with customers directly over the Internet or by sample CD or DVD. The aim was to corner both the self publishing market and move from there to provide a proprietary information standard for digital sales for book and music publishers similar to iTunes and the later Kindle and Play stores but with a direct P2P element as well as B2C and B2B.

From the beginning, the system was very attractive to independent music publishers and artists like Chet Baker's estate[44] and "Fats" Domino[45]. The system allowed immediate creation of sellable digitally encrypted content that could only be encrypted by entering card details on clicking on the file. As well as the convenience of being able to protect any file in a few seconds and render it suitable for digital sale it was appealing for small sellers who could not qualify for a credit card Merchant account" because they lacked a commercial credit history. The service also appealed to buyers because they could purchase Pay2See items using credit cards or bank account balances, without divulging credit card numbers to unknown sellers.

Moving digital content sales forward.

The new version needed no user download and gave very similar functionality for the end user to iTunes[46] without needing to install software. A single click was all that was need to purchase (and play) any given music track and that then resided on the purchasers

computer ready to play with a single click. The same applied to eBooks, PDFs, videos and other digital content. In the UK the software was available as a free download and on the cover discs of most of the major UK computer magazines at the time and had a number of cover features[47] and over 30,000 downloads of the merchant software from download.com. The maximum size for both the archive file and the individual files inside it was originally 4,294,967,295 bytes ($2^{32}-1$ bytes, or 4 GiB minus 1 byte) for standard .P2S, later expanded to 18,446,744,073,709,551,615 bytes ($2^{64}-1$ bytes, or 16 EiB minus 1 byte). Pay2See transparently implemented compression to improve download speeds by as much as a factor of 10. These are described in IETF RFC 1951. Encryption was originally based on Roger Schlafly's PKZIP cipher until the release of AES. All secure financial transactions were transmitted over SSL and wallet data was encrypted locally on the user's computer.

Initially, Pay2See offered its service with lower cost, planning to fund operations from transaction fees but growth was restricted as funding was from revenue indeed the head of a major UK venture capital firm told the company that "no-one will ever download their music from the internet". Ultimately the lower fees that PayPal were able to charge due to being venture capital funded made the market less lucrative and the Pay2See technology (including the 256-Bit AES version) was eventually transferred to AegisDRM which made the Protector, LicenseMaster, PaM and RightsServer security products (Umeh, 2007), which are used by strategic users such as the Hong Kong Government (G-Tech, 2014) and ESRI (Michiels, Joosen, Truyen, & Verslype, 2005).

Where opposites meet.

At the Department of Experimental Psychology, University of Cambridge[48] my Digital Transformation work was in the field of Psychology developing Psychophysics methods to quantitatively investigate the relationship between physical stimuli and the sensations and perceptions they affect. The work involved the analysis of perceptual processes by studying the effect on a subject's experience or behaviour of systematically varying the properties of a stimulus along one or more physical dimensions.

The work was carried out for The National Physical Laboratory (NPL) the national measurement standards laboratory for the United Kingdom, based at Bushy Park in Teddington, London, England. It is the largest applied physics organisation in the UK[49].

Once again I worked with great thought leaders like Professor Mollon (now FRS) to undertake an approach to a key field and once again I combined strategic design, a commitment to data quality and careful consideration of a huge sea of possible metrics before designing and coding a system that would use the most powerful machine intelligence structure elucidation methods with powerful parametric and non-parametric statistics to pull out information about human perception and decision making which had never previously been seen or understood. This was very much a two way process, as not only did I use digital to vastly reduce the workload but in understanding the processes that direct human attention and seeing how these could be manipulated, measured and understood I gained valuable insights that would drive future transformations.

Digital Transformation in Neuroscience

The phrase Digital Transformation is often taken to mean organizational transformation but actually there are many traditional scientific activities that have undergone transformation. The major phase of transformation started somewhat earlier than Internet based companies and was driven extensively by the introduction of desktop microcomputers into the laboratory.

Automated Data Mining

Prior to the release of the Mosaic web browser I had developed a client-server architecture web research dataminer which used FTP and later Gopher protocols to search the pre-WWW internet by spidering to retrieve all new articles matching specific search criteria. These would be printed on a laser printer each morning automatically to provide a fully automated summary of the very latest scientific research findings in the appropriate neuroscience fields worldwide on a daily basis.

The Gopher protocol /ˈgoʊfər/ is a TCP/IP application layer protocol designed for distributing, searching, and retrieving documents over the Internet. The Gopher protocol was strongly oriented towards a menu-document design and presented an alternative to the World Wide Web in its early stages, but ultimately HTTP became the dominant protocol. The Gopher ecosystem is often regarded as the effective predecessor of the World Wide Web.

The protocol was invented by a team led by Mark P. McCahill at the University of Minnesota in America and offers some features not natively supported by the Web and imposes a much stronger hierarchy on information stored on it. Its text menu interface is easy to use, and well-suited to computing environments that rely heavily on remote text-oriented computer terminals, which were still common at the time of its creation in 1991, and the simplicity of its protocol facilitated a wide variety of client implementations. More recent Gopher revisions and graphical clients added support for multimedia. Gopher was preferred by many network administrators for using fewer network resources than Web services.

Gopher’s hierarchical structure provided a useful platform for the first large-scale electronic library connections. Gopher users remember the system as being “faster and more efficient and so much more organised” than today’s Web services. The Gopher protocol is still in use by enthusiasts, and a small population of actively maintained servers remain although it was largely supplanted by the Web in the years following.

Suggested extra reading:

Drive: The Surprising Truth About What Motivates Us (Pink, 2011)

CHAPTER 6: WHO?

“For leadership, give me Scott; for efficiency, Amundsen; but when you are in a hopeless situation, when there seems to be no way out, get on your knees and pray for Shackleton.”

Polar Explorer’s Saying[50]

There is a very definite distinction between routine leadership, efficiency and being brilliant in a crisis. So who should be actually carrying out the digital transformation? What are the best choices for implementation?

In the context of a digital transformation the ideal qualities for vision and project leadership depend on how urgent the transformation is and how much buy-in there is, how motivated the team are and whether they are, or feel, prioritized.

Who will lead your transformation?

One of the key things to recognise is that making the plans for transformation under any of these circumstances is essentially a creative act. Creativity is based on networking ideas and mind-sets. This means that experience and knowledge of multiple cases and a multi-disciplinary approach increases the number of nodes in the network[51] (Varian, 1999). It doesn’t matter how fast your internet connection is or how much material there is there - if the material is not internalized in the individual it is not in the mental network and does not form an accessible node. Network efficiency is a function of transferring knowledge and network ties do not tend to form if they are not efficient or effective (Nebus, 2006).

So experience gives you more resources and greatly increases the creativity of the transformation[52].

Figure 18 The Chief Digital Officer’s Role lies at the intersection of a number of key mindsets.

It’s important, however, to have digital leadership that is technically competent, as Jonathan Sackett says, “I found that there’s been a lack of respect for the digital leaders because, well, it’s almost like, *well we’ll come up with the big ideas and then you guys just execute*. And it goes hand in glove. If you have the expertise of the technology, of the things that are possible, and you can come up with the ideas as well, well then you’ll also know a faster way to implement it, a cheaper way to do it for your clients and frankly a more successful way to implement it.”

“I firmly believe that if you first and foremost have the right digital leadership, that the buck has to stop somewhere, and I know that’s … it seems unpopular to say that and when I’ve said that in organizations it’s, “Well, you know, the creative guys should do that. Well, the account guy should … Somebody’s got to be the governor.” Well, the guy who knows the content and the context best, wins and *should* win in my opinion.

“And if I’m looking out for my corporation and I’m looking out for the client and I know the digital space the best, well, then that responsibility lies with me. And I’ve seen it where, every agency has tried committees and leadership councils and these other things. The problem with that is that compromise doesn’t always work; compromise can get you a watered down solution. I’ve been a strong advocate that, look at the end of the day, you

know, the terrible way to say that in agency lingo is, “Whose throat to choke?” They always say that. I don’t know if you’ve ever heard of that one. But in other words, who’s to blame at the end of the day and not being credited.

“I have put my throat out there, oh so many times, but it’s because, if I know the content of the context, I have to believe it enough that I know it’s the answer, not, “Well, let’s water it down here to appease this person, let’s water down there to appease that person”. At the end of the day – the coach or leader gets fired, so you have to *be* the leader.” Quoted in (Baker, 2014).

James Minter characterized another part of the challenge, the internal resistance that a CDO may experience to change, like this. “Well, I think there’s a lot of … In large organization, as you know, I don’t know what … I know there’s someone who study on it, but let’s say 30 to 40% of manager’s time is spent on internal politics. And digital is something that’s a really threatening phenomenon because it cuts as I said across all the different sides. These guys are gathering real data that proves whether someone’s doing their job properly or not.

“So I think there’s a lot of nervousness about it within organizations that probably, you know, not so very consolatory, collaborative person, then you’re going to be fighting a battle on a day to day basis with the entire management of the company. I think if you can show how, you know, the people are looking for … if you can share how that’s actually going to improve people’s lives rather than make it more difficult or show them up, and that’s where we’re meeting that barrier.” (Baker, 2014)

Leaving this central part of your strategy to reading some journals and trying to get operations, corporate IT, product development to carry out technical strategic planning functionality will be the certain route to oblivion. Digital Transformation lies completely in the field of technical strategic planning. If you remember that wonderful classic, the Peter Principle, people, and organisations, cease to progress as otherwise completely competent people are given duties above their sphere of competence. So waiting for your tame “techie” (“he knows everything technical”), your IT department, product development team or operations unit to lead the transformation of your business will create the classic situation related to planning horizon and competence which is outlined in the Peter Principle[53] (Peter & Hull, 1969)

In general while pure technical skills may not transfer, digital transformation skills are highly transferable. It turns out in particular that specific domain expertise is not as valuable as breadth of skills combined with extended experience of past internet technology cycles (like the 1998, 2000, 2004 and 2007 cycles). This combination gives much better outcomes than highly focused domain expertise without the fundamentals, which in itself simply reproduces the outcome of past systems. In other words the evidence shows that digital transformation experience is highly transferable across domains.

Figure 19 Reinterpretation of Gartner’s Hype Cycle due to experience informing selection and implementation.

Competence in Java programming, being “addicted to technology”,[54] or reading popular

articles on technology are not a substitute or even a preparation for planning and implementing an effective digital transformation strategy that will form the core of company operations for twenty years or more. Hands on experience through the cycles and a good technical overview are far more important. Furthermore, the transformation should be mandated at board level and led at C level. The Chief Digital Officer needs to be empowered at CXO rank. Experience in digital transformation of multiple industries, designing basic corporate information and control architectures and of building and leading top class teams are the true core skills whether the Chief Digital Officer is the Chief Technology Officer, Chief Digital Officer, Chief Strategy Officer or Transformation Consultant.

Figure 20 Basic Situational Leadership model. There is a strong tendency for internal transformation to be swamped by D1-D3 staff. More than most company functions what are needed are D4s

The best teams for digital transformation (and innovative start-ups) are high competence, high commitment team members who respond well to delegation. Failing that it is easier for a CDO with specific goals and skills to increase directive behavior to guide less competent staff than to increase supportive behavior for less motivated staff as the former scales more easily in lean, agile, multi-skilled environments than the latter. An excellent background in understanding these needs is given in Blanchard's Situational Leadership II Model (Hersey, 1985).

Figure 21 Situational Leadership II model. Digital transformation teams need to be in sector S4 although some members may be in S1. Teams with high S2 and S3 components will not be agile or flexible enough to create change.

The problem with strategies derived from less incisive approaches is not that they are not right, but that as Pauli puts it that they are *"not even wrong"*[55].

Building and Leading the Transformation Team

The team that implements that transformation can be built from existing talent or built to purpose. If the transformation is of an existing organization then only after familiarizing with the existing personnel can the consultant or Chief Digital Officer know which will be best. In either case the Chief Digital Officer must have hire and fire ability at least on the technical side to prevent existing staff blocking essential transformations.

Figure 22 Digital Transformation needs a range of dedicated resources.

Suggested extra reading

Start With Why: How Great Leaders Inspire Everyone To Take Action (Sinek, 2014)

Managing the Team.

Motivation

Motivation really has to be driven from outside, from above, and clearly expressed to the team in how it is treated by senior management and the board. I'm often asked, "How can I create a start-up mentality in my team?" On discussion this translates to – how can I get everyone to works 100 hour weeks and sleep under their desks without overtime. I've had CEOs tell me that people were doing great work, but the CEO was concerned that they

were going home at 5:30pm and others saying that they need that Silicon Valley air – with a full office at 7pm - and they'd spare no expense to get it - maybe I could take the guys out for "a pie and a pint" to make them work like that. I think the right term is reality check. Great teams will work round the clock for key projects that they have bought into – and some people have seen that in movies – but companies have to be realistic about what they are providing in return. It's not just that when a decade ago Google were providing free programming classes, gym and massage, but also spending an estimated $7,530 on free food for each employee[56] - that's just the icing on the cake – they also allow engineers and programmers to spend 20% of their work week on projects that interest them and over 1000 Google employees have stock grants and options that are worth more than $5 million[57]. It's not just Google - Twitter has over 1,600 millionaires[58] and Facebook similar[59]. So management need to be realistic about what they expect for what they are offering. Free pizza eaten at the desk while working on Friday won't transform you into a great magnet for talent. Great technology staff capable of carrying out a transformation are not commoditized. Motivation comes from management, but staff are not primitives without an understanding of their market value.

There are useful perks that don't cost anything but show trust in the team, but these take real management cojones to implement. Virgin's Richard Branson and Netflix's Reed Hastings both showed that they had what it takes when they implemented a no fixed vacation, vacation policy in the workplace[60]. This meant that staff were held to account for performance, not face-time, in sharp contrast to organizations that expect their employees to be in the office at all hours and never to use their allocated vacation time. As Branson says, "It is left to the employee alone to decide if and when he or she feels like taking a few hours, a day, a week or a month off, the assumption being that they are only going to do it when they feel a hundred per cent comfortable that they and their team are up to date on every project and that their absence will not in any way damage the business – or, for that matter, their careers!" Policies like this are not essential, but make a big difference to staff's feeling of empowerment.

Working environment makes a difference too and key staff called on to implement an innovative transformation (rather than carry out routine work) are likely to find that open plan offices are difficult workspaces to operate in.

Ethan Bernstein professor of business administration in the organizational behavior unit at Harvard Business School[61], found that a lack of privacy discouraged people from sharing useful practices and that "…individuals and groups routinely wasted significant resources to conceal beneficial activities, because they believed that bosses, peers, and external observers who might see them would have *no idea* how to *properly understand* them."

Anne-Laure Fayard, Professor of Management in the Department of Technology Management and Innovation at NYU and John Weeks report in the Harvard Business Review that this arrangement of personal space in the business environment, counterintuitively, inhibits informal exchange[62].

Greg Lindsay, Executive Director of the Centre for Independent Studies reports, "Higher engagement is typically accomplished not with open social space but with tight, walled-off

[areas] and adjacent spaces for small-group collaboration and interaction."

Failing to take this into account is likely to make both the information gathering and implementation of a digital transformation far more restricted.

Most important though, if management really want to make a difference it is important to let the Chief Digital Officer hand pick the right team, implement high value training right from the start, and if staff retention is important, allow perks that contribute substantially to quality of life value, share in success (through equity or bonuses) and bond through high quality, regular team-building[63].

Identifying Strategic Leadership

It's important not to mix up strategic and project leadership. The Chief Digital Officer is a C level role even if it is an interim position and operates at the Strategic Leadership level. He is not necessarily hands on project leader and generally it shows better management ability if he can delegate that role and avoid micromanaging.

One of the key things that strategic leadership does is build the team to lead the transformation. This is going to be a decisive factor in success. What does work well is starting a team from scratch or recruiting from volunteers internally in a company. In each case the team leader gets a team with "buy-in" who have psychologically signed up for the project. Having senior management other than the Chief Digital Officer allocate staff is much weaker and the weakest method of all is to simply allocate the staff who were responsible for the current system (e.g. the current IT staff) to the new project. Do that with a Chief Digital Officer who is not empowered in any meaningful way, for example to hire or fire, so that staff can simply fail to cooperate with no consequences, and transformation is very unlikely to happen in any meaningful way.

When it comes to recruiting, top talent aims to recruit staff who are better them themselves in as many ways as possible, and then improve them, while lower talents tend to recruit staff who make them look good. Thus Bs recruit Cs and they in turn recruit Ds and so forth. Once the team is full of mediocre but probably self-satisfied performers, who avoid and even dismiss better talent, the group or organization is almost impossible to recover – certainly internally.

Having acquired talent, B-grade executives say, "What if I train them and they leave?" while A-grade ones think "What if you don't and they stay?" The secret is, of course, to train people well enough so they can leave, but treat them well enough so they don't want to – a difficult concept to promote with executives who see their teams as commoditized. This isn't a trite story, but a basic philosophy. It is astonishing to see how some firms haemorrhage top talent without ever doing the necessary training, empowerment and reward to stanch the flow. Often they make a point that they can't improve their staff conditions because they are hard-nosed business people. It's probable in those cases that they don't even recognise the value of their A-grade staff. Having a top Chief Digital Officer in place isn't going to help if they can't use their ability to hire and retain the top talent that they can uniquely access and draw to them.

Figure 23 Different skills are needed for different parts of the process.

Project Leadership

With a portfolio approach a digital transformation is likely to comprise of a number of projects or business infrastructure components[64] surrounding ongoing platform development. The core platform development needs to be driven by the transformation vision so that important developments in the future are not made difficult, slow and complex. For example a publisher making a technology led decision into a web site which meets immediate needs has a significant strategic disadvantage compared with one that recognises that their core USPs are their content and community and builds a content platform with that in mind. This only becomes apparent when new forms of content, such as video and interactive and new channels such as diverse mobile and social channels emerge and the less visionary plan finds that a separate solution is needed for each medium and channel. The more properly planned, platform based approach would see each new medium and channel as a simple add-on to the already built and evolving core platform. So while you can't see the future you can see your core USPs and see that you will need a platform to deliver them over an extended planning horizon. A good example of a platform based approach is Amazon which was able to move from being a general bookseller to a company that "carries every product from A to Z", all on extensions to the same platform.

Figure 24 The Amazon logo shows that the company carries every product from A to Z - all on the same platform.

To create such a platform vision, extreme or agile SCRUM project management forms the day to day basis of development (outlined in the (PMBOK® GUIDE, 2001)), but Agile DSDM (Dynamic systems development method) or a close variant or modification will allow the platform vision to be implemented on time and on budget. Implementation of the platform is not dependent on a specific understanding of a programmer's own favoured language and schemas, but is technical strategic planning requiring an understanding of the core USPs, of their potential, of the current and future markets (which cannot just be informed by short term customer needs) and of possible supporting architectures.

Figure 25 DOVES: an effective model of running multiple Agile projects on time and on budget.

Dynamic systems development method (DSDM) is an agile project delivery framework, which is not just restricted to software but is a generic approach to project management and solution delivery. DSDM is an iterative and incremental approach which fixes cost, quality and time at the outset and uses the MoSCoW[65] prioritisation of scope into musts, shoulds, coulds and won't haves to adjust the project deliverable to meet the stated time constraint. The 'DSDM Agile Project Framework' positions DSDM as "an ideal wrapper for more limited Agile frameworks… DSDM is often used to provide the full 'project' focus to compliment Scrum's team focussed product development process."

Figure 26 The MoSCoW acronym of tasks in DSDM. Must-haves always get done, on time and on budget. Shoulds often do, Coulds sometimes.

At the same time the new DSDM manual recognised the need to operate alongside other frameworks for service delivery (esp. ITIL) PRINCE2, Managing Successful Programmes PMI-BOK and Extreme Programming.

Nevertheless, Agile requires capable individuals from the relevant business, with supplier and customer input, while the DSDM driven part of the platform and overall project development needs vision and broad architectural understanding, and can be separate from day-to-day management of the team. In agile methodologies there are also links to lean techniques, Kanban (()) and Six Sigma.

Figure 27**:** In the Agile SCRUM methodology each project team meets daily to systematically report and outline their next tasks and possible blockers. For larger projects a team leader then does the same for a SCRUM of SCRUMs

This overcomes the popular perception that Agile techniques (particularly SRUM) are best used in small-scale projects (and it means that we can still work within the two pizza rule[66]) or on elements of a wider program of work, or on projects that are too complex for the customer to understand and specify before testing prototypes or where needs may change through the process. There is a tendency for less experienced transformation leaders to try to stick to textbook or business school agile methodologies religiously while more experienced executives adjust the methods to suit the project and team.

Figure 28 In Agile SCRUM each team's tasks are written on post-it notes and placed where the whole team can see them.

Some more capable, focused sub-teams under DSDM can also work under extreme project management[67] used for more complex and non-linear projects. Both are variants of iterative life cycle where deliverables are submitted in stages. The main difference between agile and iterative development is that agile methods complete small portions of the deliverables in each delivery cycle (iteration) while iterative methods evolve the entire set of deliverables over time, completing them near the end of the project. Both iterative and Agile methods were developed as a reaction to various obstacles that developed in more sequential forms of project organization. For example, as technology projects grow in complexity, end users tend to have difficulty defining the long term requirements without being able to view progressive prototypes. Projects that develop in iterations can constantly gather feedback to help refine those requirements. The aim is to produce a business infrastructure component, product or project that best meets current customer needs and is delivered with minimal costs, waste, and time, enabling companies to achieve bottom line gains earlier than via traditional approaches.

Agile Project Leadership Network provides, as a resource, a community of practice for those using Agile methods. This should be regarded as a resource rather than treated as a semi-commercial cult as some managers treat it. In either case their "Declaration of Interdependence" extends the Agile Manifesto further into the value stream and emphasises the collaborative, whole-business nature of this work.

Adaptive project life cycle, also known as change-driven or agile methods, is intended to facilitate change and require a high degree of ongoing stakeholder involvement. Adaptive life cycles are also iterative and incremental, but differ in that iterations are very rapid (usually 2-4 weeks in length) and are fixed in time and resources.

Figure 29. Pair programming is an agile software development technique in which two programmers work together at one workstation decreasing bugs, bottlenecks and strategic errors.

When assessing work done by your teams, conventional IT measures such as production of source lines of code SLOC, (also known as lines of code LOC), the software metric used to measure the size of a computer program by counting the number of lines in the text of the program's source code, are typically not suitable. While corporate developers love this method to predict the amount of effort that will be required to develop a program or to assess productivity, as well as to estimate programming productivity or maintainability once the software is produced, when it comes to productivity and effectiveness of a transform it's like choosing the best movie as simply the longest one. Likewise face time or hours on site are not the best measure of a transformation team's effectiveness. There is a maxim that "If what you bring to the party – what you see as one of your great virtues - is the number of hours that you put in, then that probably means that your key skills and assets are commoditized[68]".

Prioritizing Digital Talent.

McKinsey's respondents expressed concerns about finding the talent their companies need to realize their digital goals. There was a lack of technical and functional skills and environments needed to encourage development and retention of skills. Unfortunately the mode of operation required was far outside the normal remit of the IT department or CIO. The new talent was recognised as the key to maintaining competitive parity and driving growth. Whatever you do don't ask your team to depend on reward by "Good Karma" or "Super Powers"[69], whoever they are. Instead, make it known clearly that you are rewarding by value (and not just short term value) to the company, organization or cause. And if that value is to grow the bottom line by 100% or keep the organization alive into the next decade be prepared to invest in that and make it known to staff through actions not rhetoric.

Operating Rules

Some of the most important rules about technology management revolve around empowerment, small teams, responsible budgeting and key staff retention and the operating rules of Lockheed Martin's special projects unit, known as the Skunk Works, still produce remarkable outcomes and are a model for lean, fast, agile management[70].

These rules might seem quaint or antiquated, but they are applied within Lockheed special projects event today, have continued to generate spectacularly effective technology projects, on budget and ahead of time year after year, decade after decade. Projects in other technology companies developed under a similar protocol include Google X Lab and the famous skunkworks of about 50 people established by Steve Jobs to develop the Macintosh computer, located behind the Good Earth Restaurant in Cupertino.

Kelly Johnson's 14 Rules Applied to the Digital World

1. *The Skunk Works manager must be delegated practically complete control of his program in all aspects. He should report to a division president or higher.* CDOs need to report to the Board or at least the CEO in all cases. It makes no sense at all to have a CDO report to any other C-Level executive or wort still to an SVP or VP. In the context any Chief Digital Officer needs to work and gather information in a more collaborative way than a project chief for stand-alone

technology would. Once a course of action is decided, however, delegation of complete control and of responsibility is a very effective way of getting a fast, cohesive MVP or game changer. In these cases and for stand alone projects Kelly's first rule is still a highly effective and well proven way of working.

2. *Strong but small project offices must be provided both by the military and industry.* This relates to the project management offices for large projects. Basically it means in our context that the contractor's office and the client's office need to each provide a very small, consistent team with the full range of skills and authority needed to manage to contract.

3. *The number of people having any connection with the project must be restricted in an almost vicious manner. Use a small number of good people (10% to 25% compared to the so-called normal systems).* In the case of digital transformation it's fine to report and get feedback on a regular basis from a broad range of stakeholders, but project reporting needs to be restricted to C-Level and Board and ideally the team needed to be hand picked by the Chief Digital Officer, not allocated or appointed.

4. *A very simple drawing and drawing release system with great flexibility for making changes must be provided.* See below

5. *There must be a minimum number of reports required, but important work must be recorded thoroughly.* The elements of 4 & 5 anticipated modern methodology and are now covered under DSDM Agile. Ideally there should be a project assistant or administrator under the CDO to achieve this and 6 below.

6. *There must be a monthly cost review covering not only what has been spent and committed but also projected costs to the conclusion of the program.* This should be submitted upwards with project reports.

7. *The contractor must be delegated and must assume more than normal responsibility to get good vendor bids for subcontract on the project. Commercial bid procedures are very often better than military ones.* Although aligned to military tendering the basic principles still apply here. It relates to contractor buy-in and attitude to the project. An important part of it relates to letting the CDO have authority to find sub-contractors or to use in house resources.

8. *The inspection system as currently used by the Skunk Works, which has been approved by both the Air Force and Navy, meets the intent of existing military requirements and should be used on new projects. Push more basic inspection responsibility back to subcontractors and vendors. Don't duplicate so much inspection.* In the world of software this can be restated as expect deliverables from subcontractors or in-house teams to be tested 100% at each step up the chain before reaching the CDO. Each self contained team pre-tests before release. Cut products released back to MVPs if necessary to pass testing under DSDM. Sandbox releases.

9. *The contractor must be delegated the authority to test his final product in flight. He can and must test it in the initial stages. If he doesn't, he rapidly loses his competency to design other [projects].* Again this boils down to expecting final deliverables of integrated systems from subcontractors or in-house teams to be tested 100% before reaching the CDO.

10. *The specifications applying to the hardware must be agreed to well in advance of contracting. The Skunk Works practice of having a specification section stating clearly which important military specification items will not knowingly be complied with and reasons therefore is highly recommended.* Using a DSDM/DOVES based project management system subsumes this fully.

11. *Funding a program must be timely so that the contractor doesn't have to keep running to the bank to support*

government projects. This applies 100%

12. *There must be mutual trust between the project organization and the contractor, the very close cooperation and liaison on a day-to-day basis. This cuts down misunderstanding and correspondence to an absolute minimum.*

13. Access by outsiders to the project and its personnel must be strictly controlled by appropriate security measures. This is more complicated in digital projects for large organizations. Performance and acceptance is going to be determined by user feedback so in this case. Kelly's 13th law may still apply to special projects being developed internally once the company has a sufficient digital maturity to not need to keep debating and testing everything that is being done in an ongoing transformation process.

An example is of Apple. One former Apple employee describes the process as being "extremely well-run and very successful at building amazing products for millions of users" and having "incredibly smart, talented, and passionate employees who absolutely love working there" He went on to say that the company has "revolutionary leaders and senior execs that constantly push the boundaries" and has "products users go crazy over", but he then goes on to outlines how "Apple is very secretive to its own employees" and "Everything is 'Need to Know Confidential'. If you didn't need to know it to get your job done, well, you wouldn't find out. The teams in my department didn't see new Lion features until the day Steve announced it on stage, even though we'd been living on and testing new builds daily, and never got to see new hardware. You had to pass through badged door after badged door to get anywhere. You couldn't get into most parts of campus. I was not allowed in the iOS areas, even though people from iOS teams could come by the Mac OS areas.". So, in Apple at least, Kelly's 13th is the order of the day.

14. Because only a few people will be used in engineering and most other areas, ways must be provided to reward good performance by pay not based on the number of personnel supervised. This lesson is one that needs to be considered very carefully to get and keep star performers. "Pay" may however be traded off for other work conditions such as flexible working practices, quality perks etc. Remember that digital is not an add on but at the core of the business. If you are considering digital as a cost center with a negative impact on profit rather than translating to bottom-line figures your model may not be allowing you to set the right priorities.

Implementing Digital Transformation

You'll remember that one of the biggest barriers to the implementation of Digital Transformation is the confabulation and co-mixing of operations, corporate IT, product development and technical strategic planning functionality.

Hopefully by now you'll recognise that Digital Transformation lies wholly, 100%, in the field of technical strategic planning. In general giving the duty to the IT department, product development team or operations unit will create the classic situation related to planning horizon and competence which is outlined in the Peter Principle (Heylighen, 1993).

Figure 30 Implementation by a dedicated transformation team is essential for long term success.

We've seen that competence in Java programming, being "addicted to technology[71] or reading popular articles on technology in Slashdot.org are not a substitute or even a preparation for planning and implementing an effective digital transformation strategy that will form the core of company operations. Lower level technologists, programmers and "hackers" typically have a range of behaviors such as trying to remove people from the team (or decision cycle) who are passionate about quality and customer experience - which many "hackers" perceive as not appreciating that "you can't eliminate bugs" or taking the attitude that "the customers need to learn to be smart enough to do [xyz]". Hackers without management experience and non-technical managers also tend to suffer from the Dunning–Kruger effect. The Dunning–Kruger effect is a cognitive bias manifesting in unskilled individuals suffering from illusory superiority – in this case in strategy, mistakenly rating their ability to take a strategic overview much more highly than is accurate. This bias is attributed to a metacognitive inability of the unskilled to recognize their ineptitude (Kruger & Dunning, 1999).

Current digital transformation strategies will remain in place for twenty years or more. Experience in digital transformation of multiple industries, in designing basic corporate information and control architectures and in building and leading top class teams are the true core skills, whether the leader of the transformation is the Chief Technology Officer, Chief Digital Officer, Chief Strategy Officer or Transformation Consultant.

DIGITAL FUTURES

No book on transformation would be complete without some vision of the future, some ideas of what the world of Horizon Three would look like

David Cook, CDO of Time Out outlines the need to “establish a framework for innovation and experimentation.” And tells us that “It is too easy to get left behind … you need to make time for thinking the unthinkable.” (Baker, 2014). Here, in closing, I’d like to share a few tasters, from the hundreds of scenarios we have developed, of what it might look like.

Four tomorrows

Of course, while no-one can predict what happens outside their sphere of control, the best way to predict the future is to make it happen.

DIGITAL CITIES

Digital personalization provides an unparalleled tool for serving the needs of a large and diverse population with relevance and focus.

Digital Systems can reproduce any process that can be clearly defined, so that broadly speaking current digital government initiatives involve the defined goal of moving services which were previously on paper onto screens.

Next generation digital services can use digital personalization to do much more, bridging the gap that makes the populace feel that government is distant and irrelevant. More and more citizens don’t look to authorities for leadership, guidance or information, they look to screens and it should be the role of a city Chief Digital Officer to coordinate the new way of interacting with the citizenry.

The issues and opportunities of a city are highly complex and real time predictive analytics can be used to show citizens initiatives, services and news that is highly relevant to their own, personal needs, values and aspirations. These types of techniques combined with targeted social media can also be used to present communities interactions in an engaging and interactive way.

Progressive leading cities have started on this path and have chief digital officers like Rachel Haot, Chief Digital Officer for the City of New York appointed under Mayor Michael Bloomberg to lead the transformation. Rachel’s roadmap for the city was exhaustive and extensive and serves as a great model for Horizon Two transformation, but what do we learn to help us create a Horizon Three transformation for a great city?

The transformation fuels local technology growth with ongoing public and start-up collaboration in building the infrastructure for transformation. This can include sponsored start-up competitions and public voting to give a massive public buy-in and buzz.

By designing digital projects to be inclusive and viral, transformation becomes a tremendous focus both for city pride, as there is a focus on showcasing, and for actively promoting the city’s USPs at exactly the time and place that they are relevant to the user. Prizes (which need not be monetary or very substantial) can be given for promoting, tweeting, sharing new sub projects as they are brought in by start-ups collaborating etc.

This creates a transformation that feels like a huge groundshift made of hundreds of different, exciting new ideas and movements (a sort of technological Edinburgh Festival or Burning Man effect sweeping the city).

Costs are minimized through corporate sponsorship and models similar or at least analogous to Google's revenue models.

Because of omni-channel and pervasiveness digital today is perhaps the strongest possible Public Relations tool that a city administration can possess, both for the city and for the administration – it's far more than just a web channel.

At present perhaps the best way to do this on a moment-to-moment basis would be to interact with visitors and city dwellers through a city app[72] that provides them with all their main needs in the city in an intelligent way – pulling in[73] news (local and global), weather, city policy, events, timetables, geotargeted (local) reviews and city entertainment and dining information as well as mapping and navigation data, and learning to present all these in a very simple, intuitive and relevant smartphone interface. Now, with the city app, at a glance at the main app screen a user knows where he or she is and where local facilities including transport are, can get a timetable or call a city cab at the click of a button or the sound of the user's voice, glace at the latest news[74] and weather, or quickly find out about both prestige city events and localized events and dining, but all presented in a way that best responds to city needs. Key city facilities are also available just as easily.

In depth information and services continue to be delivered through the city web site, which becomes more of a general city portal encouraging daily access. Streaming (TV) is incorporated as much as possible or suitable and personal data and preferences are securely integrated with the city app so that users feel that they are accessing a single great hub. Even unique city search can be implemented to create a feeling of community as greater relevancy is achieved through location and city specific results and prioritization of higher quality content over low.

Executed correctly, digital can act as a 24/7 measure of what visitors and citizens are thinking both in response to articles, blogs, news, on-line focus groups, questionnaires and spontaneously in social media. Thousands or hundreds of thousands of inputs can be analysed and reported as they happen and reported as part of a single smartphone screen to monitor the pulse of the city as well as being accessible in depth to analysts and policymakers. In day-to-day life (and minute-to-minute) this would be used to make every interaction personalized and focussed whether it's the time of the next bus home and direction to the stop or the latest news on Peer Outreach or London's Low Carbon Entrepreneur, or perhaps news from the Safer London Foundation as well or the directions to the nearest Pocket Park focussed using recommendation technology on the users likely personal needs.

Bricks and mortar subsidizing online? Could LiveShowrooms Reverse the trend?

According to ShopperTrak U.S. retailers received approximately half the peak foot traffic they experienced previously and there is a growing trend to examine and test products in the store and then comparison shop and buy on-line. There is no single recognised strategy

known to reverse this trend at present, but what could be done to reverse this earth-shaking trend in retail?

One thing we know for certain is that customers are still trying-out products, examining and feeling them in store. A virtual on-line store using 3D rendering, and better graphics does not really address that – it doesn't leverage the bricks and mortar's USP to create a brand distinction or a strong visceral buying impulse. As well as the lower customer engagement in product USP, browsing experience in a 3-D virtual store is still inferior to the physical store and impulse buying is no more enhanced than any other web store.

Removing the physical products in the store and having a store full of on-line terminals, sometimes regarded as an iShop, misses the point too. The customers go to bricks and mortar stores not because they don't have an internet device to shop on, but because it is a chance to see, feel, smell, touch and experience the physical products.

The concept of LiveShowrooms turns the concept around. Allow the customers to come into a fully populated showroom and let them experience and test as they cannot do online. When they want to buy though let them do that by swiping a card or pointing a smartphone at a QR code on the product, and implement one-click shopping principle to allow the product to be delivered same day (or in the evening or maybe even next morning) so that they get impulse buying satisfied as well as better convenience than buying either online or in a store (no carrying heavy bags or items). Retailers can split test the effect of delivery times and whether to offer comparison shopping and beat or challenge the best price on-line then and there, depending on their market and its habits and price sensitivity.

Zero-Click Shopping

One of the great revolutions that Jeff Bezos of Amazon pioneered was the concept of One-Click Shopping. We know that each step in the shopping process can lose between 40% and 60% of visitors on an E-commerce web site – so two clicks will lose approximately 75% of visitors, three clicks will lose 87% etc. We also know that there is a shift to mobile while the Nielsen Norman Group say that mobile content is twice as difficult to navigate, and this prioritizes a different concept in shopping. We call this Zero-Click Shopping. In this the user simply tells their smartphone app the product that they want "dish washer" or "Beats headphones" and using a combination of voice recognition, predictive, memorized preferences and personalized recommendation technology the app starts to show the user the product that they want. If the item is correct the user just says "yes that" or repeats the item name "Buy Beats headphones" and a one click process arranges for them to be dispatched. The number and complexity of confirmations is split tested to minimise (or optimize) the number of returns and accidental purchases while maximizing revenue. Retailers can thus create a channel that is even easier to use and interact with than Amazon, eBay or other internet shops.

Virtual Transformation

Virtual Transformation is yet another separate future technology concept not in retail but in creating a universal management tool for organizations. What if you create something that looks like a transformation, but isn't? Generally not a good idea, more like creating a parachute or lifejacket that looks like one, but actually isn't. However, there are

circumstances where virtual transformation does work. Many board members and senior executives want to have live reporting of core company metrics but, as Christian Purser Chief Digital Officer of M&C Saatchi told me while I interviewed him for this book, if you say something like you want to get all your data in one place, “You watch the CTO sort of, you know, sort of start, you know, texting his wife and look at eBay, because you just know that that’s a ridiculous statement to make in a multinational company”. Still it may be what the CEO and senior executives actually need and there is a way by using products like Metanautix Quest to unify the company data to make it look as though it is in one database and then use a big data insight or reporting panel like Adatao on the CEO and board’s smartphones and desktops, live. If this is created in the correct self-auditing structure with internal automated crosscheck to show if different information sources are contradictory (i.e. automatic checking of reporting) this will prevent the terrible reporting problems that have devastated the boards of leading retailers.

These new concepts are just the tip of the iceberg, there are hundreds more and a portfolio approach is always needed. Furthermore, in trying to copy them, in order to implement effectively you really need to understand the fundamentals that created the concepts – they are great but you have to be prepared to dig deeper. Having said that, there is a world of opportunity out there if you are prepared and, in the words of the song,

“Things are going great, and they’re only getting better … The future’s so bright, you gotta wear shades.”

AFTERWORD

You'll notice that I've taken the liberty to key a few acronyms in this volume. I've introduced concepts like the Documentation And Transformation TeAm DATTA, Transformation ANalysis GlObal Requirements TANGOR, TRansformation INformation Gathering TuRING and Dsdm OVEr Scrum DOVES. I've tried to be as sparing as possible in this, but I felt it necessary as having a word or a pronounceable acronym to describe a discrete concept focusses discussion and allows easy management of complex concepts. Socrates tells us that "The beginning of wisdom, is the definition of terms" and if we consider the situation where we had to describe each new concept in turn each time we wanted to reference it, we will understand why this is not an affectation but a necessity to discuss technical issues. What we have here is not the need for fewer keystrokes but for a more concise and clear expression of concepts. This is, of course, also an expression of Peter Drucker's maxim that "the best way to predict the future is to create it". I should note that for business and technical usage I don't see any problem in using these recursively for clarity.

You may also have recognised that I created the structure of this book from a quote from English Nobel prize winner Rudyard Kipling. However, if you do you'll also see that I've taken the liberty to rearrange his "six honest serving-men" and if you have I'm sure that you can see exactly why I've done that! (Kipling, 1902)

GLOSSARY

A/B SPLIT TESTING (OFAT – One Factor At A Time): This is the most basic testing imaginable. It's simple and easy. All you do is test one thing against another and apply one of a range of simple statistical tests. This should be happening all the time in your organization. If it isn't, ask why.

AGILE An approach where projects and products progress and develop in incremental iterations. The product works from a very early stage, so improvement can be made based on real user feedback and testing.

API An application programming interface (or API) is a way of making information available from one program, service or system to other developers for use in tools and services. APIs allow developers to use information quickly and easily, and help to ensure that they can access data in the most efficient way available. For example using the Facebook API other programs and services can, with the right permissions, post messages to Facebook and read information from it.

COMPREHENSIVE USER PROFILE DATA CUPD A profile which normally contains personal preferences and purchases, but typically the full digital footprints and analytics of the individual over all available channels, e.g. social, mobile, app, loyalty cards, multichannel purchasing, multiple computers and devices etc. which may be either Anonymous or Identified. See also Ultra Personalization.

CRUFT is the software term for anything that is left over, redundant and getting in the way. It is used particularly for superseded, useless, superfluous or dysfunctional elements in computer software which is typically introduced during poor specification or lack of design-stage identification of all classes of activity that the software will perform. It's highly relevant here because it is responsible for slowness, incomprehensibility and unreliability of systems. As a general rule the time it takes to implement a new feature, the time it takes to understand or debug a problem[75] and the chance of a software failure all increase by the square of the number of lines of code (or cruft). Programs in general use can easily be 90% cruft. That means that such a program takes a hundred times longer to debug, add a feature or just understand than a lean, cruft-free program. As a rule of thumb if you have a system that is reputed to be understandable only by the people who made it, to need fine turning or care, or is massive, the chances are that it is full of cruft.

DEMAND-DRIVEN SUPPLY NETWORK. IN A DIGITAL TRANSFORMATION IMPLEMENTATION OF A DEMAND-DRIVEN SUPPLY NETWORK (DDSN) INTEGRATED WITH DEEP ANALYTICS CREATES A POWERFUL METHOD OF SUPPLY CHAIN MANAGEMENT WHERE SUPPLY CHAINS ARE ADJUSTED OR EVEN BUILT IN RESPONSE TO DEMAND SIGNALS. DIGITAL ALLOWS DDSN TO BE DRIVEN BY CUSTOMERS DEMAND SO THAT IN COMPARISON WITH THE TRADITIONAL SUPPLY CHAIN, DDSN USES THE PULL TECHNIQUE.

DDSN DOES NOT JUST APPLY TO B2C MARKETS BUT ALSO TO NOT-FOR PROFIT ORGANIZATIONS WHERE DDSN COMBINED WITH PERSONALIZATION WILL ALLOW STAKEHOLDERS TO SEE HOW THE ORGANIZATION SERVES THEIR OWN PERSONAL NEEDS AND VALUES ON A DAY TO DAY BASIS AND

IN A WAY THAT SURVIVES DRILL-DOWN. IN THE CASE OF B2B AND COMMODITIES NOT ONLY CAN PRODUCTION AND HR BE ADJUSTED TO MARKET NEEDS, BUT MAINTENANCE DOWNTIMES CAN BE SCHEDULED IN DOWN PERIODS AUTOMATICALLY. TYPICALLY THE DDSN CAPABILITY MODEL CONSIST OF FOUR LEVELS. THE FIRST LEVEL IS REACTING, THE SECOND LEVEL IS ANTICIPATING, THE THIRD LEVEL IS COLLABORATING AND THE LAST LEVEL IS ORCHESTRATING. THE FIRST TWO LEVELS FOCUS ON THE INTERNAL SUPPLY CHAIN WHILE THE LAST TWO LEVELS CONCENTRATE ON EXTERNAL RELATIONS THROUGHOUT THE EXTENDED ENTERPRISE. A FULLY DIGITAL DDSN WILL ULTIMATELY SPAN ALL FOUR LEVELS. SMALLER BUSINESSES DEPEND ON A DEMAND DRIVEN CHAIN WHERE A CUSTOMER ACTIVATES FLOW BY ORDERING FROM THE RETAILER, WHO REORDERS FROM THE WHOLESALER, WHO REORDER FROM THE MANUFACTURER, WHO REORDER RAW MATERIALS FROM THE SUPPLIERS. ORDERS FLOW BACKWARD, UP THE CHAIN, IN THIS STRUCTURE. FULLY TRANSFORMED LARGER BUSINESSES FEED DATA FROM THE CUSTOMER BACK TO ADJUST FROM THE TOP DOWN.

TYPICALLY THE RESULTING SHIFT IS SAID TO BE FROM A “BUILD-TO-FORECAST” TO A “BUILD-TO-ORDER” DISCIPLINE. THIS IS AN OVERSIMPLIFICATION WITH MANY PRODUCTS BEING BUILT IN THE FAR EAST AND HAVING A SHIPPING TIME THAT PRECLUDES THIS MODEL. IN THESE CASES THERE ARE A RANGE OF OPTIONS WITH HIGHLY RESPONSIVE MANUFACTURE, MULTIPLE LATENCY SHIPPING CHANNELS, AND AUTOMATED FIRMWARE UPDATES FOR DIGITAL PRODUCTS BEING JUST A FEW. EVEN TAKING THAT INTO ACCOUNT THE PROPERTY OF BEING DEMAND-DRIVEN IS ONE OF DEGREE: BEING “ZERO PERCENT” DEMAND-DRIVEN MEANS ALL PRODUCTION/INVENTORY DECISIONS ARE BASED ON FORECASTS, AND SO, ALL PRODUCTS AVAILABLE FOR SALE TO THE END USER IS THERE BY VIRTUE OF A FORECAST. THIS COULD BE THE CASE OF FASHION GOODS, WHERE THE DESIGNER MAY NOT KNOW HOW BUYERS WILL REACT TO A NEW DESIGN, OR THE BEVERAGE INDUSTRY, WHERE PRODUCTS ARE PRODUCED BASED ON A GIVEN FORECAST. A “100 PERCENT” DEMAND-DRIVEN IS ONE IN WHICH THE ORDER IS RECEIVED BEFORE PRODUCTION BEGINS. THE COMMERCIAL AIRCRAFT INDUSTRY MATCH TO THIS DESCRIPTION. IN MOST CASES, NO PRODUCTION OCCURS UNTIL THE ORDER IS RECEIVED. A DIGITALLY TRANSFORMED BUSINESS WILL AS IT MOVES TO HORIZON THREE SHIFT FORECASTS TO BEING DRIVEN IN REAL-TIME BY SALES ANALYTICS (AND EVEN DIGITAL PRE-SALES ANALYTICS) SO THAT IN FASHION, PRODUCTION WITHIN A SEASON WILL CHANGE IN AN AGILE WAY TO RESPOND TO WHICH STYLES AND DESIGNERS ARE SELLING RIGHT NOW.

IT’S WORTH NOTING THEREFORE THAT DIGITAL TRANSFORMATION OF DDSN IS MORE THAN JUST HAVING A GOOD FORECAST OF THE COMPANY THROUGH DATA. ALTHOUGH LEAN MANUFACTURING IS A GREAT AIDE IT IS ONLY ONE PART OF THE DDSN CHAIN AS IS HAVING GREAT DATA ON ALL

THE CUSTOMERS.

DIAL (DIGITAL AGILE): This acronym has been specifically coined to cover the digital-agile approach – using the flexibility of digital data and media to generate quantitative statistics to allow informed decisions and even pivots to be implemented in real time is different from the concepts of agile and digital used with a range of meanings and emphases in close proximity. i.e. Use digital data combined with digital processing to make a fully informed decision which can make not just short term tactical changes to a plan or road map (promote these items, change ad-spend on this category etc.), but even fully informed and not arbitrary changes to strategic direction (e.g. cut these lines, mid season; invest in X,Y,Z today, purchase or expand in A,B,C today)

DIGITAL is commonly used to mean internet-enabled; such as desktop, laptop, tablet, mobile or digital devices not yet invented.

DIGITAL-AGILE is a term or set of terms in general use describing a "cloud" of concepts implying newness or novelty (digital) and rapid change (agile). It is different from DIAL above as without a specific, numerically sound process in place it is much more general and much less actionable.

DATTA Documentation And Transformation TeAm Transformation ANalysis GlObal Requirements

DOVES. Dsdm OVEr Scrum. DOVES is a transformation project management process where DSDM is used to outline the project goals, budget and timescale giving an outward appearance of waterfall, but using agile SCRUM during day to day project management giving agile flexibility.

DUNNING–KRUGER EFFECT – A cognitive bias manifesting in unskilled individuals suffering from illusory superiority – in this case in strategy, mistakenly rating their ability to take a strategic overview much more highly than is accurate. This bias is attributed to a metacognitive inability of the unskilled to recognize their ineptitude (Kruger & Dunning, 1999).

DSDM is an agile project management system that fixes cost, quality and time at the outset and gains flexibility by prioritizing deliverables so that deliverables that are defined as "Must Have" are always delivered, "Should Have" often, "Could Have" occasionally and "Won't Have" never.

FACTORIAL TESTING emerges from Taguchi testing (see below). This is like determining the 80/20 rule for your data to find out what little bit is really making the difference.

FLESHWARE: Use of people to do, typically repetitive, work that can be done at least as well or better by a machine. The fleshware refers to the people who are carrying out the function of either software (programs) or hardware (machines). Nobel prizewinner Richard Feynman describes designing a fleshware 'super-computer' made of punch card machines and human calculators to do the complex calculations needed to design the atom bomb at Los Alamos. There are many other instances in pre-computing era organizations where complex calculations were carried out by rows of specialists with pencils and papers or abacuses. Earlier implementations include vast libraries of medieval monks

acting as printing presses by writing out manuscripts and pairs of sailors (often duplicated for accuracy) acting as speedometers and sonar by casting knotted lines behind the ship, timed against one or more sand hourglasses and leaded lines below it for depth. The relevance is that the most important tasks that we attribute to digital transformation (e.g. Amazon's success) involve a move, at least of the more repetitive and commoditized parts of the task, from fleshware to software.

FRACTORIAL TESTING emerges from Taguchi testing and minimizes the amount of data need to run a statistical test (often dramatically).

HYPER-CLOUD: A form of distributed computing or distributed information processing where the cloud consists of typically millions of individual computers transparently connected typically across the internet to form a (typically private) cloud resource. SETI@home ("SETI at home") running on BOINC at the Space Sciences Laboratory, University of California, Berkeley, is similar concept in terms of gross architecture, but a Hyper-Cloud is complexly transparent to the end user – they don't know that it exists at all.

KLUDGE: a workaround or quick-and-dirty solution that is clumsy, inelegant, difficult to extend, and hard to maintain. The implication is that it is poorly thought out as well. Not all quick and dirty solutions are kludges – spraying WD40 or using duct tape often fixes the basic problem quickly and effectively and would not count as a Kludge (although the duct tape might be a "jury rig"). Using butter to lubricate, paper wedges or twine to position or fasten in the same circumstances would probably count as a kludge as these would degrade and cause problems over time. Kludges in computer code are very common and lie at the heart of many serious problems. In terms of pronunciation Kludge rhymes with Judge but there is an alternative spelling Kluge, which is a different word relating to baggage, often confused with Kludge.

MULTIVARIABLE TESTING: This means many things are tested at once. This can be like headlines, sub-headlines, several things on a web page.

MULTIVARIATE TESTING: This kind of testing simply means testing many combinations in one area. So it is possible to set up tests to test say a whole range of colors or fonts in an ad creative (or business practices) and apply statistical tests.

MVP Minimum viable product is the product with the highest return on investment versus risk, what is known in the investment community as the Sharpe Ratio. Alternatively it is the product with the least investment in time and resources that will either test or establish a new market. As such it is an implementation of the Pareto principle or 80–20 rule. It may involve carrying out market analysis, but due to reduced resources can be launched on a hunch or gut feeling and in this case acts as market analysis in itself. A good example of an MVP is Google's Gmail. Paul Buchheit creator and lead developer of Gmail. says, "The first version of Gmail was literally written in a day". It's important that senior management don't intercept and take over a MVP adding huge feature wish lists that make it inviable before it is launched as I've seen in some instances.

ORTHOGONAL ARRAYS A specific way of designing and setting up things to be tested, used with the Taguchi method.

PARETO PRINCIPLE, also known as the 80–20 rule, states that, for many events,

roughly 80% of the effects come from 20% of the causes. It's a key rule in running lean organizations e.g.,

80% of your sales will come from a product with 20% of the functionality

80% of a company's profits come from 20% of its customers

80% of a company's complaints come from 20% of its customers

80% of a company's sales come from 20% of its customers

80% of a company's profits come from 20% of the time its staff spend

80% of a company's sales come from 20% of its products

80% of a company's sales are made by 20% of its sales staff

Therefore, many businesses have an easy access to dramatic improvements in profitability by focusing on the most effective areas and eliminating, ignoring, automating, delegating or retraining the rest, as appropriate. Mathematically, the 80–20 rule is roughly followed by a power law distribution (also known as a Pareto distribution) for a particular set of parameters, and many natural phenomena have been shown to exhibit this distribution.

NO-CLICK SHOPPING. A development on one-click shopping where an app on a mobile device can find an item in a retailer's inventory, purchase it and have it paid for and delivered to a previously input address with a minimal number of voice commands (Like "find Tefal Frying pan", "buy Tefal Frying Pan" [that's all] – repeating the item name to reduce accidental purchases).

ONGOING TRANSFORMATION PROCESS (OTP) Essentially transformation can be regarded as either a discrete[76] process which happens just once or over a short period or it can be regarded as an ongoing process in which the impact of new technologies on the whole are assessed on an ongoing basis. With a discrete transformation process a company might develop a web site or even put into place a web team and a CTO to oversee "technology" – in an OTP there would be a CDO continually monitoring (or in the consultant role regularly monitoring) the whole industry to look for major transformation opportunities (like the emergence of geolocation based apps like Uber in the taxi/minicab industry).

PROXIMITY APPS A class of apps, typically applicable to retail, where the customer's location is used to trigger functionality in the app. In one that I designed and developed for a client the app user was alerted as they approached retail stores which stocked particular items that they had browsed on the internet separately or items that were recommended for them. The app would then show step-by-step directions and a map guiding the customer to the store, and if necessary create a store voucher to trigger a conversion. Apple's iBeacon indoor positioning system is a variety of proximity app introduced in 2014 using low-powered, low-cost transmitters to notify nearby iOS 7 devices of their presence. In contrast to NFC where shoppers actually have to tap their smartphone onto an NFC chip in order to be receive content, iBeacons transmit small packets of information, from 5 centimeters to more than 50 metres depending on the environment.

SCRUM is an iterative and incremental agile software development framework for managing product development. A key principle of Scrum is its recognition that during a

project the customers can change their minds about what they want and need (often called “requirements churn”), and that unpredicted challenges cannot be easily addressed in a traditional predictive or planned manner.

SMAC A DIGITAL TRANSFORMATION PORTFOLIO INCLUDING SOCIAL, MOBILE, APP AND CLOUD. Integrated SMAC treats all these as add-ons to the company’s core platform. Separate development of Social, Mobile, Apps without sharing data sources and analytics is Random SMAC.

STATISTICAL VALIDITY answers the question “How Sure Are You?” When you get results from a test, how sure can you be that you will continue to get those results? This is statistical validity. It is expressed as a p-value, which we also use for all types of scientific and medical testing.

SYSTEMS INTEGRATOR: A systems integrator (or SI) is an individual or business that builds computing systems for clients by combining hardware and software products from multiple vendors and ensuring that those subsystems function together.

TAGUCHI methods (Japanese:) are statistical methods developed by Genichi Taguchi to improve the quality of manufactured goods, and now used in engineering, biotechnology, marketing and advertising. Taguchi effectively combines A/B Split Testing (OFAT – One Factor At A Time); Multivariate; Multivariable; Factorial and Fractorial to give Statistical Validity. It can give a clear mathematically supported answer to complex questions using a minimal amount of data.

Traditionally, statistical methods have relied on mean-unbiased estimators of treatment effects: Under the conditions of the Gauss-Markov theorem, least squares estimators have minimum variance among all mean-unbiased estimators. The emphasis on comparisons of means also draws (limiting) comfort from the law of large numbers, according to which the sample means converge to the true mean.

TANGOR, TRansformation INformation Gathering. The transformation stage where we gather the specific information needed for the organizational analysis and the initial recommendations and global requirements audit.

TROMET Transformation ROad Map budget. The essential budgeting stage of the transformation. This is essential if the transformation is actually to be delivered.

TuRING The basic information gathering phase for a digital transformation. Takes place after the initial report and takes 30-90 days.

UNIVERSAL REPORTING. Universal reporting allows company executives to have a single dashboard or control panel where every key metric of a company is reported in real time. This can include cross checking and validation using different data sources to spot discrepancies in reporting. Use is extremely easy for the board members, directors and senior executives, often from a mobile device, but in a large and mature organization with hundreds or thousands of separate units to monitor the implementation is complex although certainly not impossible with knowledge of the right tools and an understanding of integration and security issues.

ULTRA PERSONALIZATION. Personalization that explicitly creates a non-aggregated digital profile of every user and customer on a system. This not only contains personal

preferences and purchases but typically the full digital footprints and analytics of the individual over all available channels, e.g. social, mobile, app, loyalty cards, multichannel purchasing, multiple computers and devices etc. This divides into either

Identified Ultra Personalization IUP, typically getting the mandate to store comprehensive user profile data CUPD in association with the user names, typically through a loyalty card or through opt-in.

Anonymized Ultra Personalization where the information uniquely describes a customer and can be applied to them but is not linked to a specific named customer. This can, for example, be data obtained during browsing prior to log-in or may be obtained over a prolonged period like IUP, but having all identifiable data anonymized at the server end using cryptographic hash codes or other methods. The CUPD in Anonymized Ultra Personalization can be converted easily to Identified Ultra Personalization at any time with customer permission.

Either form of Ultra Personalization can be used predictively to determine future buying preferences, for targeting advertising and promotions etc.

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[1] Alibaba Group Holding Limited (NYSE: BABA) is a Chinese e-commerce company that provides consumer-to-consumer, business-to-consumer and business-to-business sales services via web portals. It also provides electronic payment services, a shopping search engine and data-centric cloud computing services based primarily around Alibaba.com, a business-to-business portal to connect manufacturers with overseas buyers. Contrary to popular belief the export market is not entirely Chinese and Alibaba.com handles sales between importers and exporters from more than 240 countries and regions. Having carried out transactions through Alibaba across multiple markets for many years it is quite striking how the structural nature of transactions differs between "western" portals like Amazon and EBay and Alibaba.

[2] Hannington Tame's strapline is "We bridge the gap between digital leadership and great companies. Partner with us and connect to the generation of pioneers who are changing the world. Partner with us because the future is human."

[3] PricewaterhouseCoopers (trading as PwC) is a multinational professional services network. It is the world's second largest professional services network, as measured by 2014 revenues, and is one of the Big Four auditors, along with Deloitte, EY and KPMG. PwC is a network of firms in 157 countries with more than 195,400 people. It had total revenues of $34.0 billion in FY 2014. As of 2013 PwC United States is the sixth-largest privately owned organization in the United States.

[4] Instagram is an online mobile photo-sharing, video-sharing and social networking service that enables its users to take pictures and videos, and share them on a variety of social networking platforms, such as Facebook, Twitter, Tumblr and Flickr. A distinctive feature is that it confines photos to a square shape, similar to Kodak Instamatic and Polaroid images, in contrast to the 4:3 aspect ratio typically used by mobile device cameras. Users can also apply digital filters to their images which allows users to share and portray their lives as they happen in the form of slightly faded nostalgic photographs or short "retro" videos. The service was acquired by Facebook in April 2012 for approximately US$1 billion in cash and stock. In 2013, Instagram grew by 23%, while Facebook, as the parent company, only grew by 3%

[5] WhatsApp Messenger is a smartphone messenger available for iPhone, BlackBerry, Android, Windows Phone and

Nokia. WhatsApp uses 3G or WiFi (when available) to message by text, video, images, audio with friends and family. Facebook announced its acquisition of WhatsApp Inc. on February 19, 2014, for US$19 billion

[6] Part of American military (and business) folklore is the concept of putting everything that you have and making every possible sacrifice to defending a single piece of high ground. The concept is exemplified by the Battle of Bunker Hill, Cemetery Hill and Little Round Top to name but a few. The question is, of course, are you putting everything into defending the right hill? Are you dying defending the wrong hill while the real, decisive, battle flows around you or is fought elsewhere?

[7] E.g. to describe agile development environments, or to indicate in a general way that we are working in a new medium "digital" and we have to be prepared for change and be "agile" –true – but no truer than it would have been in the early days of print or iron foundries.

[8] If any of these terms are new to you, check the glossary for explanations.

[9] An American-based provider of home movie and video game rental services formerly Blockbuster Entertainment Inc.

[10] http://tusb.stanford.edu/2008/01/barry_mccarthy_chief_financial.html

[11] http://hbr.org/2011/04/how-i-did-it-blockbusters-former-ceo-on-sparring-with-an-activist-shareholder/ar/1

[12] Although not in terms of the damage that it would have avoided

[13] Intense customer pain point that should have very high priority.

[14] A subsidiary of Johnson & Johnson

[15] Risperidone is a second-generation atypical antipsychotic. It is a dopamine antagonist possessing anti-serotonergic, anti-adrenergic and anti-histaminergic properties.

[16] With many parallel sessions running up an overnight recording rather than the standard 20-30 minutes

[17] Nobel prizewinner Richard Feynman's describes designing a fleshware 'super-computer' made of punch card machines and human calculators to do the complex calculations needed to design the atom bomb at Los Alamos.

There are many other instances in pre-computing era organizations where complex calculations were carried out by rows of nerds with pencils and papers. Earlier implementations include vast libraries of medieval monks acting as printing presses by writing out manuscripts and pairs of sailors (often duplicated for accuracy) acting as speedometers and sonar by casting knotted lines behind the ship, timed against one or more sand hourglasses and leaded lines below it for depth.

[18] Risperdal profit was 97 per cent of its sales

[19] The Times Higher Education World Reputation Rankings 2014 puts University of Oxford at number five worldwide, ahead of University of California, Berkeley; Princeton University; Yale University; California Institute of Technology (Caltech) and University of California, Los Angeles (UCLA). I'd rate the fact that it wasn't higher due to the fact that at Oxford and Cambridge the research student is highly empowered and left to swim or sink in his or her research rather than being mollycoddled and spoon fed – hence discoveries like the Jet Engine and DNA.

[20] Using Probit Analysis – the probit function being the quantile function associated with the standard normal distribution. It has applications in exploratory statistical graphics and specialized regression modelling of binary response variables.

[21] Miyamoto Musashi (c. 1584 – 13 June 1645)

[22] Typically an AdTotum network has more processing power available than the nearest comparable system SETI@home which, while it has over 5.2 million participants worldwide, and is described as the distributed computing project with the most participants to date, normally has about 145,000 active computers in the system in 233 countries and has the claimed the ability to compute over 668 teraFLOPS.

[23] or father's hand if we follow the patrilineal version

[24] Archaic Homo sapiens, the forerunner of anatomically modern humans, evolved between 400,000 and 250,000 years ago. Anatomically modern humans evolved from archaic Homo sapiens in the Middle Paleolithic, about 200,000 years ago. The transition to behavioral modernity with the development of symbolic culture, language, and specialized lithic technology happened around 50,000 years ago according to many anthropologists

[25] TuRING - TRansformation INformation Gathering

[26] TANGOR - Transformation ANalysis GlObal Requirements

[27] DATTA - Documentation And Transformation TeAm

[28] TROMET - Transformation ROad Map budgET

[29] Scrum is an iterative and incremental agile software development framework for managing product development. Scrum spreads responsibility across the team and is well suited to non-technical and consensual management styles.

[30] Dynamic Systems Development Method is a standard based on Rapid Application Development and Agile Method. In digital transformation it typically needs visionary leadership with good high-level technical understanding but is very powerful for on-time, on budget delivery of projects.

[31] DOVES Dsdm OVEr Scrum

[32] ESPRIT - Elicitation of SPecific RequIremenTs

[33] Time Out is a global media group that , spans 68 cities across 37 countries with a monthly combined audience of over 33 million. The business provides the platform and marketplace for inspiring people to make the most of their city through a distribution network, which incorporates a growing online presence, mobile applications, magazines, events and partnerships.

[34] Tenfold growth or 1000%

[35] E.g. PRINCE2, Waterfall, Prototype model, Incremental Iterative V-Model Spiral Scrum Cleanroom RAD DSDM UP XP Agile Lean Dual Vee Model TDD BDD FDD DDD MDD

[36] PRINCE employs a conceptual Waterfall model of projects, where elements of the delivery flow sequentially into one another.

[37]

[38] A digital footprint is the trail of data that is left behind by users on digital services. There are two main classifications for digital footprints: passive and active. A passive digital footprint is created when data is collected about an action without any client activation, whereas active digital footprints are created when personal data is released deliberately by a user for the purpose of sharing information about oneself. Passive digital footprints be can be stored in many ways depending on the situation. A simple early concept in an online environment would be that a footprint may be stored in an online data base as a "hit". This footprint may track the user IP address, when it was created, and where they came from; with the footprint later being analyzed. In a true big data environment the who user story would be part of that footprint, where they came from, when and how, what they did exactly what their path was through the site, what actions they took and how that fits with their whole use or interaction with the particular site or family of sites.

[39] MATLAB (matrix laboratory) is a brilliant, multi-paradigm numerical computing environment and fourth-generation programming language by MathWorks. It's the tool of choice of a large proportion of numerate scientists as well as engineers and economists and contains the ability to carry out matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, and Fortran.

[40] A heat map is a graphical representation of data where the individual values contained in a matrix are represented as colors. Fractal maps and tree maps both often use a similar system of color-coding to represent the values taken by a variable in a hierarchy.

[41] Garbage in, garbage out (GIGO) in the field of computer science or information and communications technology refers to the fact that computers, since they operate by logical processes, will unquestioningly process unintended, even nonsensical, input data ("garbage in") and produce undesired, often nonsensical, output ("garbage out").

[42] A kludge (or kluge) (kl$\overline{oo}$j) is a workaround or quick-and-dirty solution that is clumsy, inelegant, difficult to extend, and hard to maintain, yet an effective and quick solution to a problem. This term is used in diverse fields such as computer science, aerospace engineering, internet slang, and evolutionary neuroscience.

[43] My favorite IaaS cloud solution in terms of flexibility (not being stuck with one platform, hardware or software) and portability (not being stuck with one provider) is OpenStack is a free and open-source software cloud computing platform developed by NASA and Rackspace in 2010. It is primarily deployed as an infrastructure as a service (IaaS) solution. The technology consists of a series of interrelated projects that control pools of processing, storage, and networking resources throughout a data center, able to be managed or provisioned through a web-based dashboard, command-line tools, or a RESTful API.

[44] Chesney Henry "Chet" Baker, Jr. (December 23, 1929 – May 13, 1988) was an American jazz trumpeter, flugelhornist and vocalist. – no relation to the author.

[45] Antoine "Fats" Domino Jr. (born February 26, 1928) is an American rhythm and blues and rock and roll pianist and singer-songwriter. Domino released five gold (million-copy-selling) records before 1955. He also had 35 Top 40 American hits and has a music style based on traditional rhythm and blues ensembles of bass, piano, electric guitar, drums, and saxophone.

[46] Apple's launched of iTunes in January 9, 2001 exactly on the schedule that we predicted at Pay2See four years before.

[47] Magazines including .net (magazine); Computer Shopper (UK magazine); Computer Weekly; Computeractive; Micro Mart; PC Advisor; PC Direct; PC Format; PC Plus; PC Pro; PC Tools (magazine); PC Utilities; Personal Computer News

[48] The Times Higher Education World Reputation Rankings 2014 put University of Cambridge at number four worldwide ahead of University of Oxford (5); University of California, Berkeley (6); Princeton University (7); Yale University (8); California Institute of Technology (Caltech) 9 and University of California, Los Angeles (UCLA) 10

[49] NPL is an internationally respected centre of excellence in measurement and materials science. Since 1900, when Bushy House was selected as the site of NPL, it has developed and maintained the primary national measurement standards. Today it provides the scientific resources for the National Measurement System financed by the Department for Business, Innovation and Skills.

[50] Paraphrased here and variously attributed to Sir Raymond Priestley and SIr Edmund Hillary

[51] A generalization of Metcalfe's law states that the value of a network is proportional to the square of the number of nodes (e.g. connected users) of the system (n^2). The original was first formulated in this form by George Gilder in 1993, and attributed to Robert Metcalfe in regard to Ethernet, Metcalfe's law was originally presented, circa 1980, not in terms of users, but rather of "compatible communicating devices". I of course equally applies to accessible pieces of information, data or experience in a person's head when it comes to searching for synergies.

[52] Alternatively we could say that in terms of network topology the Average path length is orders of magnitude longer for externalized data when compared with internal knowledge.

[53] The Peter Principle is a concept in management theory in which the selection of a candidate for a position is based on their performance in their current role rather than on their abilities relevant to the intended role. It is named after Laurence J. Peter who co-authored with Raymond Hull the humorous 1969 book The Peter Principle: Why Things Always Go Wrong. The authors suggest that people will tend to be promoted until they reach their "position of incompetence".

The Peter Principle is a special case of a ubiquitous observation: Anything that works will be used in progressively more challenging applications until it fails. This is "The Generalized Peter Principle." There is much temptation to use what has worked before, even when it may exceed its effective scope. Peter observed this about humans.

In an organizational structure, the assessment of the potential of an employee for a promotion is often based on their performance in the current job which results eventually in their being promoted to their highest level of competence and potentially then to a role in which they are not competent, referred to as their "level of incompetence". The employee has no chance of further promotion, thus reaching his or her career's ceiling in an organization.

Peter suggests that "in time, every post tends to be occupied by an employee who is incompetent to carry out its duties" and that "work is accomplished by those employees who have not yet reached their level of incompetence." He coined the term hierarchiology as the social science concerned with the basic principles of hierarchically organized systems in the human society.

He noted that their incompetence may be a result of the skills required being different rather than more difficult; by way of example, an excellent engineer may find that he or she made a poor manager due to a limitation of the interpersonal skills required by a manager to effectively lead a team.

Rather than seeking to promote a talented "super-competent" junior employee, Peter suggested that an incompetent manager may set them up to fail or dismiss them because they will likely "violate the first commandment of hierarchical life with incompetent leadership: [namely that] the hierarchy must be preserved".

[54] Read – uses consumer gadgets

[55] Quote from the Nobel Prize Winner Wolfgang Pauli when asked whether a particular way of doing things was right. His reply was "Das ist nicht nur nicht richtig, es ist nicht einmal falsch!" - that it was "not even wrong", implying that it was so wrong thinking, irrelevant and lacking in understanding that it didn't even consider the right questions.

[56] http://www.businessinsider.com/2008/4/googles-ginormous-food-budget-7530-per-googler

[57] http://www.nytimes.com/2007/11/12/technology/12google.html

[58] http://jobs.aol.com/articles/2013/11/11/ipo-millionaires-the-few-the-proud-the-unbelievably-lucky/

[59] http://www.reuters.com/article/2012/02/02/us-facebook-wealth-managers-idUSTRE8112BR20120202

[60] http://www.virgin.com/richard-branson/why-were-letting-virgin-staff-take-as-much-holiday-as-they-want

[61] http://hbr.org/2014/10/the-transparency-trap/ar/1

[62] http://hbr.org/2011/07/who-moved-my-cube

[63] An if you think that can't afford it for your transformation team then the chances are that when someone who can afford to acquire and retain staff like that enters your market you'll understand that it wasn't a great economy

[64] A business infrastructure component is some key component of an overall digital infrastructure

[65] The MoSCoW acronym breaks down to

MUST have this requirement to meet the business needs.

SHOULD have this requirement if at all possible, but the project success does not rely on this.

COULD have this requirement if it does not affect the fitness of business needs of the project.

WON'T represents a requirement that stakeholders have agreed will not be implemented in a given release, but may be considered for the future.

[66] Jeff Bezos's idea that if the project team is too large to be fed by two pizzas then it is too large to communicate effectively internally.

[67] Other elements of extreme programming include: programming in pairs or doing extensive code review, unit testing of all code, avoiding programming of features until they are actually needed, a flat management structure, simplicity and clarity in code, expecting changes in requirements as time passes and the problem is better understood, and frequent communication with the customer and among programmers. The methodology takes its name from the idea that the beneficial elements of traditional software engineering practices are taken to "extreme" levels. As an example, Code reviews are considered a beneficial practice; taken to the extreme, code can be reviewed continuously, i.e. the practice of Pair programming.

The conventional drawbacks are eliminated by the Chief Digital Officer who ensures that requirements are consistent, takes ownership of compromises and conflicts, as well as design specification and allocates documentation tasks.

[68] But if you do see value as being proportional to hours worked you are in good company as this is fully in accordance with Mehrwert and Marx's labor theory of value, where human labor – as a commoditized entity - is the only source of net new economic value,

[69] http://time.com/3486673/microsofts-ceo-satya-nadella-women-work-gender-pay-gap/

[70] Kelly Johnson's 14 rules give a "down-to-brass-tacks" management style and are still extensively used today in fast moving, closely budgeted tech projects http://www.lockheedmartin.co.uk/us/aeronautics/skunkworks/14rules.html

[71] Read – uses consumer gadgets

[72] An app rather than a website as an app can feed the user information and alerts depending on location, time, and personal information volunteered by the user.

[73] Using third party APIs so than none of this needs to be generated in-house

[74] Combined with appropriate city public information and city council reports

[75] Because debugging is not a linear process but concerns interactions with existing code and variables.

[76] individually separate and distinct.