

Technology is taking over – but are we really getting the best from it?

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1. Abstract

The world has irrevocably changed in the last 50 years with regards to technology in the work place. Some view technology and the Internet of Things as the solution to all problems while others see them as the creation of our current problems. By-and-large we have forgotten that technology is a resource from which we must derive value. Value comes from ensuring the benefits exceed the costs. Most organisations are not getting the most from their technology because they have forgotten that it is not just the tangible technology resources that matter but also the intangible resource competencies such as knowledge, capability and attitudes of employees that matter. By harnessing these intangible competencies organisations will be able to understand and manage their data, and therefore improve their decision making. Further their operations staff will become better equipped to deliver on the efficiencies technology offers. When organisations understand this they will be able make the most of the technology they have as well as make informed purchasing decisions moving. Until then they will continue to be frustrated at their staff seemingly underutilising the technology they have already purchased. Overall this paper looks into whether or not technology is adding value to the way we work or if it is just becoming another tool in the toolbox that is misused.

2. Introduction

The term Internet of Things (IoT) is bandied around a lot these days. Along with the terms smart technology and smart/connected cities/infrastructure. The result is inconsistency in the use of these terms resulting in those that promise the world and sceptics who believe that it will be the end of the world. Attempting to go back to basics, technology is, “the application of scientific knowledge for practical purposes” (Wahab, Rose & Osman, 2012, p. 64). However, that is itself quite complex as the terms science and knowledge are themselves highly debated. Furthermore, going back to the Greek word tekhnologia meaning ‘systematic treatment’ does not help any more. Academics cannot even seem to agree on the term, concluding that the use of the term technology is “voluminous, extensive, and varied in perspectives” (Wahab, Rose & Osman, 2012, p. 64). Given this, the term technology in this paper will use is one used more colloquially, electronics, computers, non-manual gadgets and software. In the Water, utilities, and infrastructure space in general, this then refers to the use of computers and various software programmes, the use of devices in

the field such as cell phones, and tablets, leak detection and underground location tools, CCTV units, and pump stations. On their own, and collectively, these technologies have transformed, and continue to transform the industry.

Going one step further we can introduce the concept of the internet. The internet is essentially a mechanism that facilitates communication and data transmission. Thereby connecting various technologies to each other and humans to the data from the technology faster, in larger quantities and remotely. This results in the emergence of smart technologies and connected infrastructure. This is essentially the Internet of Things¹. The ability for things, both physical and virtual, to be connected and share data. Given that this has irrevocably changed the world and the water and infrastructure industries the following looks at what it means to use technologies, many of which are now connected to the internet in, in infrastructure. The following looks at what technology is within the context of organisations, how we determine value and then explore the key reasons organisations are not getting maximum value from their technology.

What is technology in the context of organisations and infrastructure?

Technology is first and foremost a resource. A resource that is used as a tool by people. Tangible technology resources are found in the form of both hardware and software. It comes with a direct cost attached. This is the cost of a new laptop, sensor or software programme. It is something that can be purchased, rented or hired.

What is value?

The answer it seems is strikingly simple. Value is when the benefits outweigh the cost. The hard part to the answer comes about in identifying, determining and quantifying the benefits and costs in order to work out this calculation. Value calculations started out as defined in economic terms, moved towards more holistic perspectives and now sit largely in limbo with all these competing ideologies. The financial cost/benefit mechanism is a favoured indicator of value because numbers create a common language, can be determined and have fixed ratios for comparison. The introduction of elements such as utility/usefulness, quality, functionality and other less easily quantified elements add a layer of complexity (Kelley, Morledge & Wilkinson, 2002) which we, as humans, are not well equipped to handle.

¹ See the Global Standards Initiative on Internet of Things if you want to see a technical, long-winded definition.

The challenge is really in how benefits and costs are determined. The roots of this issue are quantification and perception. Quantification is idealised because of the ability to validate, compare, and convince. Numbers can be checked. Numbers enable people to speak the same language. However, numbers create a (false) bottom line and often are seen as a natural truth. Perception and opinion are often seen as soft and unmanageable. Decisions become based on politics, storytelling and those who can gain the most influence. This is seen as unfair and unjust, especially in when asset beneficiaries perceive that they are missing out as a result. The result is that value must be demonstrated numerically. However, numbers are not necessarily unbiased. Further, despite this desire to quantify benefits the reality is that many decisions are made based on perception.

There are two perspectives I will cater to here. One is that of asset owners² who are acting on behalf of the public and the second is that of an organisation delivering a service or product.

Asset owners and infrastructure delivery organisations are looking at value from difference perspectives. Asset owners, as trustees, are looking to ensure that the asset is well cared for, and that maximum benefit is incurred for beneficiaries. Value is assessed vis-a-vis the asset and the needs of the beneficiary. Organisations however, are looking at how technology resources can maximise the outputs vis-à-vis inputs as they go about their operations.

Through various reforms and political forces, asset owners have been forced to adopt the idea of best value. Fox (2001) summarises this as the “duty on Councils to obtain best value in the delivery of local services and that this ... is linked with a rigorous regime of performance indicator and efficiency measures. [Where] Councils would need to demonstrate to their communities the quality and efficiency of services” (p.7). Although seemingly simple and appropriate, this approach is flawed and as a result has lead asset owners away from a custodial approach driven by the interests of the beneficiaries and towards an inward focused approach where measurement, performance and targets take precedence over fiduciary duty.

For organisations, value, and the decision to adopt or continue to support technologies, is linked to the revenue and profit. Cost-benefit analysis are conducted frequently. Also

² Interesting that we call them asset owners the approach is quite similar to that of the legal concept of a trustee. While the full legal rights are not applicable the core element of a trustee who “has the power to control and manage” (p. 233) while a beneficiary is able to enforce obligations. The obligations in this sense do not meet the legal standard but nonetheless operate in the same manner.

frequently heard is the complaint that technology costs too much or does not do the job operations want and need. However, irrespective of how diligent the individuals are that prepare the cost/benefit analysis they are unable to remove themselves from being subjected to the issues of quantification and perception. Crude cost calculations are based on product purchase price and the cost of implementing the technology is frequently underestimated. Benefits tend to look at easy to calculate changes in behaviour such as the reduction in labour hours because a job can be dispatched directly to a device and job allocations for a crew optimised. But what about the benefit of being more efficient that results in increased customer satisfaction and therefore happier clients? This tendency to look for easily quantifiable costs and benefits while it understates both the benefits and costs most significantly fails to force organisations to understand the intangible impacts of technology on operating.

From both perspectives value is still the excess of benefits over costs.

The missing piece of the puzzle is the intangible resources related to technology. Resources can be both tangible and intangible. Intangible resources come in the form of relations and competencies. Relational competencies are not considered here. Intangible competences consist of the knowledge, capabilities and attitudes of the people in an organisation. Therefore, intangible technology resource competencies are inherently connected to people. A knowledge competence is knowing why something works. It is more theoretical and can generally be captured and documented. However, to be enacted a person is still required. An example of this is the rote learning of a coding language such as SQL (pronounced sequel) in order to select and return data. In contrast, a capability competency is the know-how of writing a query which returns data that meets the needs of the user and is accurate. Finally, attitude competencies are the state of mind of an organisation or individual. With respect to technology this is predominantly in the form of a willingness to learn about and adapt to new technologies. Therefore, when we talk about technology we must look further than just the tangible resource and consider the intangible resource component of using technology.

The point of this paper is not to enter into a discussion on how best to quantify various elements; the focus here is to highlight that for quantified or non-quantified cost-benefit analysis to be possible organisations must first become aware of, then interrogate and finally comprehensively understand the intangible resources components related to technology. The discussion in this paper will focus on the three intangible resources competencies with respect to technology. This is not because choosing the right technology is not important but

because without understanding how competencies support the use of technology organisations will continue to purchase the wrong technology for their needs.

What does it mean to get value from technology?

Re-wording the cost/benefit equation we can say that value from technology is achieved when users and organisations are able to optimise the resource in a manner that best suits their needs and objectives.

Bringing together the premises that (1) **technology is a tool for capturing and communicating data in order to make decisions**, and (2) **technology is a tool used by people** we can conclude that we do not get the best value from technology because we fail to recognise that it is the intangible resource competencies of knowledge, capability and attitude that extract value from tangible resources. As a result organisations either are not using the right technology or are underutilising what they do have. This is a failure to both realise benefits and manage costs..

3. Technology and Decision Making

We collect data but what use is it if our decisions do not follow from it.

Decision making is a choice between alternatives (Goldratt, 1990, p. 2). In organisations decision making occurs thousands of times a day. From the CEO to field staff. Some decisions will have clear consequences, others less so, but all decisions add up. Often times the decision is whether or not to change tact or continue as is. Technology has facilitated the mass creation of data. The relationship between technology and decision making is through data. Data can be provided in a non-numerical form as video from a camera in a sewer line identifying a break caused by roots. It can also be reports of the numbers of jobs completed per day, per technician, by job type. When talking about data the latter tends to be considered the most. The first set of data, the video is created by the technology while the second set, a report, most commonly in an excel spreadsheet or similar, is not new data but the volume and speed at which the data points can be collected and collated is significantly improved by technology such as laptops and tablets in the field connected to the internet. However, these data sets alone mean little. Data needs to be transformed into information and then used to make decisions and inform behaviour, see Figure 1.

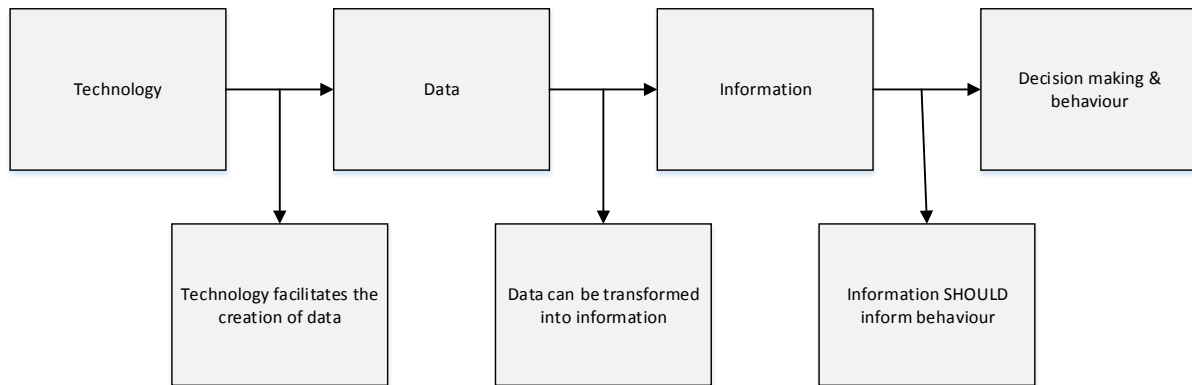


Figure 1. Technology supports data creation which can be transformed by people into information for decision making.

Data and information are not the same. Data are fact points void of any real meaning. Information surfaces when data points come together to answer a question or tell a story. A GPS co-ordinate is irrelevant unless combined with another, relevant, data point. For example the GPS co-ordinate tells me that there is meant to be a manhole in this location. A video of a broken sewer line means nothing unless I know whether or not it is an asset I'm responsible for. Knowing where to start looking for a covered manhole or that the break in the line is an asset I need to fix, is information. This information begins to inform my decision making. I choose to do an investigative dig here, not there. I choose to repair the line rather than leave it. Data is typically taken for granted. It is well documented that organisations are failing to optimise performance due to their inability to “translate this data into meaningful insights” (Goldratt, 1990, p. 9). The ability to arrive at these meaningful insights is where the benefits of technology come from. Without being able to understand the benefits accrued, you will not be able to determine if you are getting value from your technology.

One key area in which data is consistently poorly managed and utilised is job management systems. Job management systems offer two key opportunities to support decision making. The first is planning of work and the second is in reviewing the work completed. Real time access to jobs allows crews to receive job information in the field. Crews can have access on the spot about the condition and history of an asset. This requires tablets and laptops that can handle the software installed on them, tolerate the conditions in which they are used, are user friendly when working in the pouring rain at 2am in the middle of winter and have internet access. The second is in reporting such as looking at the time taken to dispatch a job, whether KPIs were met, what materials, time and plant were used on the job. This requires a system that allows these data points to be captured and shared between client and contractor and ensures relevant data is inputted. All of this is required simply to have the right data for the decision maker. None of this makes the decision for the user.

In order to realise the value from the data created by technology, you need to focus on the intangible resources of your people. People make decisions. For data to be *transformed* into information and for that information to be used in decision making you must focus on the knowledge, capability and attitudes of your employees. Knowledge in this respect, is the act of knowing how design and manage a system in order to collect the right data, to be able to manipulate the data, to clean-up data once collected and then provide data in a format that can be used by others. This is the knowledge to know that collecting specific asset information helps your asset management team or your client. Capability is the ability of employees to turn data into information. This requires more than just taught knowledge about statistics and systems and integrates knowledge of the business into the numbers and figures. It is also the capability of operations teams to make daily decision. Can you team connect the dots between reoccurring faults two streets apart from each other? Finally, attitudinal resources refer to the willingness and openness of employees to integrate data-driven information into their decision making processes. Data cannot transform itself, nor can it be created or collated without human input into the design of the technology. Failure to design or select the technology that meets the needs of the organisation leads to inappropriate data which will not support decision making. People design this technology. People decide what technology to bring into the business. People use, or fail to use, the data created.

Value from technology comes when you understand that it is a tool which supports decision making. Once you understand the questions you are asking you will know what technology you need in order to provide you the data to make said decisions. As can be seen though, the key link is still people. The following sections looks at how people are necessary to truly realise the value in technology.

4. Technology and People

Systems don't save people, people save people. Systems help people save people.

You are not getting value from your technology because when it comes down to it people are the glue that bring it all together. The following will go through a series of examples, be them situations or comments people make, and address how a focus on knowledge, capability or attitude in these situations can help you extract more value from your technology.

My favourite phrase is "this programme/laptop/tablet/device is useless", or "that system is stupid, who knows why we got it". This is my favourite because the majority of the time it has do with user error and all three intangible resources considered here. Most technology users are not provided with the basic skills in order to use the technology. In order for people to be

able to problem solve they need to know the basic components of what makes that system work. In order for you to understand which valves to shut off you have to have a basic understanding of how to read a drawing and what can go wrong. Technology is no different. This is a knowledge competency issue. If the users of technology do not know the basics of using their devices and what is required from the device, right from the start will not get the best value from it.

The second layer, the capability competency, is around the ability of a user to adapt an item of technology to meet their needs. This is linked to the phrase “but we’ve always done it what way”. I see this most often in reports that are created where I have to ask the question: “what is the point in this? Wouldn’t you rather know XYZ?” I have spent the last few months supporting a team to write better queries that interrogate their data and answer the questions the operations team has³. No new technology needed. The data was already sitting in the system. It has been collected since the start of the contract. But there was no one in the team that had the capability to transform operations questions into technical queries. There were plenty of operations members who knew what questions they wanted answered. Furthermore, there were a few team members who had the capability to write the queries. The problem was, the two had not been put together. If you want to increase the value you get from technology you need to expand the capability of those in your team from experts on one side of the fence to those who can create bridges.

The final component is attitude. When people have very strong feelings about a piece of technology, be it hardware or software, it is usually because they are frustrated by it. The majority of the time they are frustrated because they cannot do what they want. This is not the same as the system not doing what they want. They just have not learnt yet. There also has to be the attitude towards using technology. When someone says ‘this doesn’t work let’s just go back to paper’. Do not let them. Coach them and grow their skillset and through this they will be able to see that technology is useful tool. With this their attitude will change.

Some would say that increasing competencies will result in higher costs and therefore not create a greater surplus of benefits over cost. This could indeed be true in some instances. Without interrogation, however, it is not possible to tell which competency improvements would support increased value. While there will be, at times, a need for external training, you will find that you can address your own knowledge, capability and attitudinal issues in-house.

³ I am not an expert in queries and coding by any means. But I know enough to write some queries myself and be able to communicate effectively with the experts. Most importantly I have been able to reduce the frustrations between each team.

You already have your go-to experts. Rather than drown them in a higher workload, allow them to spend the time with staff training them informally on using the system. Let them take the time to go into the field and show staff. Let your office staff use Dr. Google to find a better way to write a query or set up an excel spreadsheet. Most importantly, attitude change comes from demonstrable action. Do not just tell staff they have to use an item of technology; understand it yourself. Be able to engage in conversation with them when they say 'this device or system sucks'. Your engagement with them will have a far larger impact than a classroom based training course.

Conclusion

The IoT has taken off. Based on the connection of technologies which supports faster, greater data sets organisations are faced with conflicting messages that technology is both the answer to their questions and the creation of all their problems. Technology is a resource that, like all other resources, gives maximum value when utilised appropriately. To maximise the value from technology you need to develop the intangible resources of knowledge, capability and attitude in your people with respect to technology. You are not getting value because you have forgotten that technology is a tool to be utilised. Technology does not replace people, it supports people to do their jobs better. However, poorly understood technology which as a result you fail to manage will prevent your personnel doing their jobs and result in unrealised value.

5. References

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