

Wicked Problems - the real challenge to progress in IT?

Cobb's paradox states that we know why software projects fail, we know what we should do to avoid failure in the future, but for unexplained reasons we don't do it. This paper proposes an explanation based on the idea that many managers do not understand the nature of the problems they face.

Too many managers believe the problems they deal with in their projects and improvement initiatives can be (fairly) easily understood and solved in some form of logical progression when, in fact, the challenge is far greater.

First there is the anecdotal evidence. The delivery of services or systems to your users and customers seems endlessly dogged by problems. Typical characteristics of these problems are:

Recognise any of the following?

The symptoms are well known, often prefixed with the comment "**We always have problems when we do**".

We have made attempts to solve them but most have failed. Despite the good intent no one really understands why the failures have occurred. **Everyone has his or her own views and there is little consensus of opinion.**

Solutions have included many ideas; adoption of new working practices, or software technologies, or project management systems or quality management systems. **However, it has never been clear just how any of the solutions tried was meant to solve the problems.**

Staff are left feeling that the organisation is trying to cope with problems that are elusive. You can see and measure their effects but you can never really pin them

down. You may have spent countless hours in meetings discussing them and have been left with the feeling that you were never making any real progress. **All you were doing was endlessly circling the problem and never finding a route to its heart.**

For more formal evidence see the the UK Government report (**bibliography ref 40. I McCartney, Successful IT: Modernising Government in Action, Cabinet Office, 2000.**) available [here](#) on the Government's web site. Many causes of failure are cited with the most critical being non-technical; business, managerial or human. The report makes it clear there are not just one or two problems that can be solved easily, but a wide variety that interact and are more demanding.

So what is going wrong? Has anyone stood up at a post-mortem meeting and asked "Do we really understand the nature of the problem?". That is to take a step back from the specific problem and try to divine its real nature. There is a corollary to this that challenges the abundant confidence of IT professionals; are we dealing with a problem type that we cannot solve or, more precisely, that we do not yet understand?

Tame and Wicked Problems

For the moment we will say that we face two types of problem in IT - Tame problems and Wicked problems. Tame problems are relatively easy to describe. They are solved by following a linear progression from diagnosis to solution. As an easy example you have

written a program that does not compile. You examine the compiler output and correct any syntax or semantic errors you have made and re-compile. OK, that was too easy. You have written the program according to the specification and you run tests based on it. Errors appear in the output. The problem investigation is more extended. Did you understand the specification? Does the program reflect the specification? Did you create the right test cases and data? There are more factors to consider but the progression is the same, go through the factors eliminating them until the causal one(s) is found.

Now do not think that Tame problems are, by definition, easy to fix. They may be technically very complex and require significant skill and experience to solve. The key point is that Tame problems are well bounded. The problem domain is relatively small.

In comparison, Wicked problems have characteristics that require a much more extended and iterative approach. They are:

The problem changes as you examine it. Symptoms become red herrings, causes become symptoms and the true causes, when identified, are often quite surprising. The problem may be only fully understood when a solution is found. Failure to identify the real problem is one reason why so many initiatives fail - organisations try to solve the wrong problem.

There are no simple solutions. The problem has many variables and stakeholders that interact and must be considered. Over simplification, ignoring important variables, leads to sub-optimisation. Sub-optimisation can create larger problems than the original, e.g. by moving the problem to another part of the organisation where it has even worse consequences.

There are no standard solutions (magic bullets). Every instance of a Wicked problem is unique. Each organisation has its own business, technical and human needs that must be considered. Apply standard prescriptive solutions (which may be complex) and you apply inappropriate solutions. This leads to the solutions becoming unsustainable as many of the real aspects of the problem remain and will create pressure to revert to the original behaviour.

There are no perfect solutions. The problem contains conflicting elements or constraints, areas where trade-offs or compromises are needed. You can only make the correct judgements on compromise if you understand all the variables and the unique situation of the organisation. Failure to compromise successfully results in poor cost-benefit outcomes. In business terms they may be economically unviable.

Obviously there is a gradation of problems from the very Tame to the extremely Wicked. The key issue for managers is to adopt techniques that can determine where on this scale a problem sits and identify the appropriate problem-solving techniques.

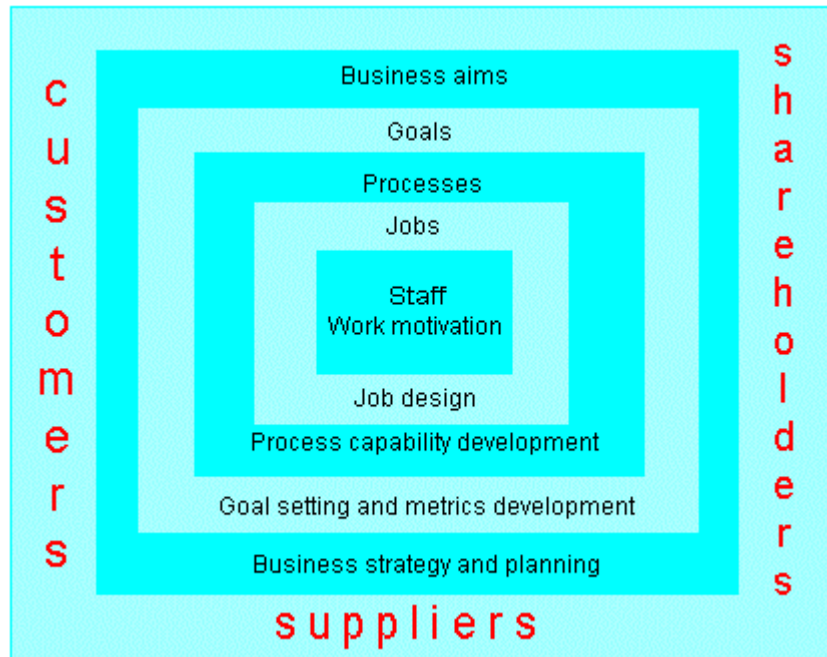
The Growth of Wicked Problems in IT

Do not think that Wicked problems are a new idea. They have been known about for many years and within IT certain technical activities such as systems analysis and design are acknowledged as Wicked problems. More recently human motivation is being acknowledged as one of the most overlooked Wicked problem. We see an expansion of Wicked problems due to the changing relationship between IT and business.

Over the years IT has become more and more closely bound to business performance. Any changes or improvements we make can have far-reaching effects on business operations. The

extreme example is Internet trading where the web site is the shop, the critical interface to the customer, and getting site design or implementation wrong can be disastrous. As some have commented, your competition is only a mouse click away. How many of us have browsed sites containing flashy graphics and animation, but where the route to a purchase is so tortuous we have made that click?

To start understanding the situation of IT we remove organisational factors. Capability and effectiveness are not guaranteed through any organisation model and, indeed, organisation can be a red herring. We strip away organisational issues and consider functions essential to operations; using the simplified model below.



The layers represent:

External stakeholders - customers, shareholders and suppliers.

Business aims, that relate to satisfying the stakeholders, need to be identified in the business strategy.

Goals, internal business, management and technical goals derived from the business aims, need to be set and supporting control measures put in place.

Processes, groups of related activities required to achieve specific goals, need to be designed so as to give the appropriate degree of capability.

Jobs, the tasks that individuals perform to execute processes, need to be designed so

they not only reflect the processes but the motivational needs of the staff.

Staff, the primary resource in a knowledge-based company and the key internal stakeholders, need to have the motivational stimuli that matches their growth needs and results in high productivity and quality of work

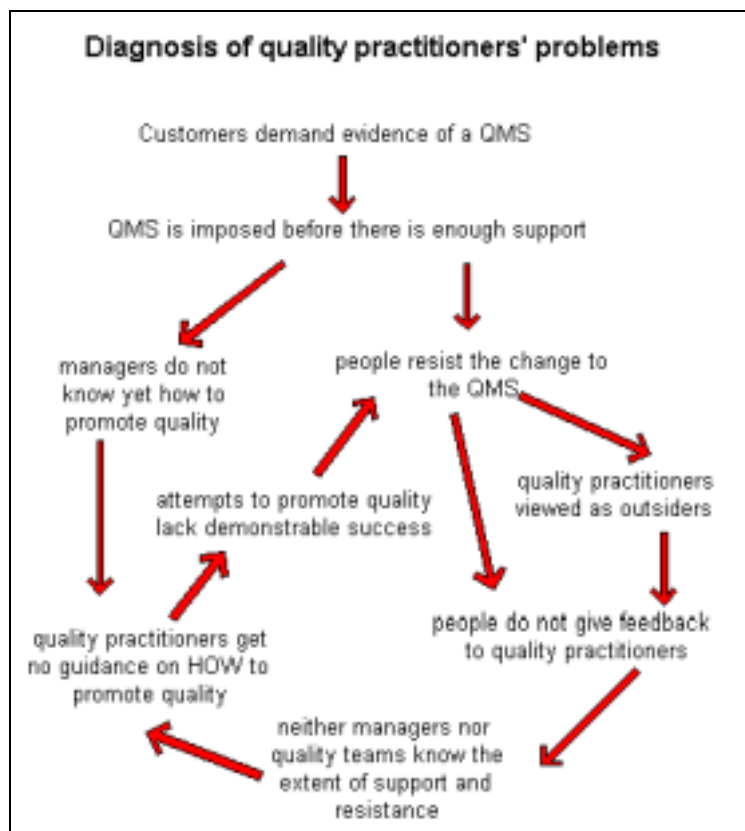
This diagram contains many possible relationships between adjacent and non-adjacent layers. A change in one layer may have repercussions in one or more layers. Similarly a problem found in one layer may have causes in several others. In theory there are 720 combinations in this simplified model; some of which will be irrelevant and others critical. For example, a Tame problem may involve one layer, e.g. technical aspects of a process that require attention. While such problems may be causing some loss of

performance, business or otherwise, the solution does not involve changes in the other layers.

In contrast a Wicked problem involves many layers. Common examples are the implementation of a Quality Management System (QMS) or new IT processes. Highly detailed and lengthy models and standards can describe what you need to do to but they do not tell you how to implement these activities to make them work successfully. They do not tell you how to understand and manage the many interactions between layers.

What does a Wicked Problem look like?

In the **Motivational Survey of Quality Practitioners (bibliography ref 19)** we uncovered a class of Wicked problem that relates to implementation of a QMS. In the following diagram we show what happens when we adopt a Tame approach and the new (Wicked) problem it creates. To explain the dynamics of this example we find it useful to use a vicious circle of behaviour.



The circle starts with external pressures on an organisation to implement a visible/certifiable QMS. With the emphasis on implementing a QMS, which is not synonymous with improving quality, there is neither the level of support for it nor the knowledge of how to promote quality more generally. Quality practitioners' jobs are designed around the QMS requirements and not on what is needed to promote quality as no one has worked out how to promote quality in the organisation.

Attempts to promote the QMS lack demonstrable success, there is resistance from other staff who view quality practitioners as intruders and there is lack of feedback.

Consequently no one really understands how effective the QMS is or the degree of support or resistance for the quality initiative. The quality practitioners are unable to learn how to promote quality successfully, the organisation continues to

promote the QMS and we go around the circle again with failure reinforcing failure.

This example contains a catalogue of errors caused by adopting a Tame approach

The goal is to gain QMS certification in response to customers' demands. Is that a valid goal? The first characteristic of a Wicked problem is that it changes as you examine it. Gaining QMS certification is not the real problem or issue, but a symptom. One real (business) goal is to deliver quality products and services that make customers buy, and keep on buying. Certification is a means of making this visible to customers. Unfortunately adherence to procedures in a QMS is no guarantee of quality; indeed it may deflect attention from the real problems.

With our goal compromised more problems are created. With no agreed business goal stakeholders have varying degrees of agreement and disagreement about the QMS. Because the goal is to implement a procedural-based QMS as opposed to improving quality it is handed down as a tablet of stone to managers and staff. The managerial and technical sub-goals are all about QMS implementation. The QMS is seen as the "simple" solution, even though staff and supervisors may find it difficult to implement and find themselves jumping through many hoops. Adherence to standard procedures may solve some problems but will often create larger ones.

The QMS does not really allow for exploration of the real quality problems in an organisation, so genuine concerns go unattended. Vital variables or stakeholder views are overlooked. The QMS cannot be tailored in any meaningful way because we do not have the understanding to do this. Compromise between the ideal and reality becomes impossible.

Other major outcomes are that poor goal setting means that the wrong metrics are developed so no one can measure the true impact of the QMS on business performance.

Any metrics that are developed may become red herrings, giving misleading views. Worst of all the quality practitioners are doing the wrong jobs, bureaucratic jobs that are de-motivating and will lead to transfers and resignations.

So where are we? In this example the failure to acknowledge that implementing a QMS is a Wicked problem (or should it be Wicked challenge?) has created another Wicked problem - a QMS that is failing. The problems identified in the circle cannot be solved by a Tame approach. If you address each issue in turn without considering the relationships the solution will be a mix of sub-optimisation and over-simplification - the other issues will create pressure that prevents the solution from working. To solve a Wicked problem like this you must address as many of the issues as possible in parallel. The circle must be broken in many places simultaneously for the solution to be sustainable.

Wicked problems and maturity

The more we help clients the more we learn that at low levels of maturity Wicked problems abound and as an organisation matures they are less frequent. This is reflected in the SEI CMM where at level I there is chaos across all the levels of our diagram (Wicked) and by level V outstanding problems are within individual processes (Tame). Unfortunately most best practice guides, models and methodologies encourage a Tame approach by default. Despite the plethora of new development paradigms, technologies and management systems developed over the last two decades their very low success rate confirms that the people implementing them are unaware of Wicked challenges and problems.

Conclusion

At the outset our goal was to provide an explanation of Cobb's paradox. Why do we not improve even though we know what to do? The answer is that we do not know HOW to do it, but kid ourselves that we do. Consequently many

initiatives fail and will continue to fail because they are based on Tame problem approaches.

In conclusion Cobb's paradox is no more than a reflection that many IT

organisations are beset by Wicked problems and IT professionals have yet to learn how to recognise and solve them. Better still, we should be educating professionals so they can respond successfully to Wicked challenges.

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