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TRIZ Case Studies – Real Problems Solved

(names and applications have been altered to protect confidentiality but otherwise, this is how it happened)

TRIZ Workshop to redesign an industrial fire-alarm

One of Oxford Creativity's clients is well established in providing various fire-alarms for industrial clients worldwide. Their best selling product - **IWFA** - had been on the market for 9 years, was well proven and trusted but was now losing market share. The company felt that as they publicly espouse innovation they needed a step change, a big improvement on their current product. They wanted to launch a new design to replace their current one and as it was a fire-alarm it had to be utterly safe, reliable and predictable. So the company wanted a new, innovative product with no risk.

For some time they had been looking for a more up to date design incorporating new technology which would solve the problems now emerging from their out-of-date product. They wanted a new, improved product to replace their existing IWFA at a similar price to compete in the market with the same reputation for reliability and robustness. Competitors were launching similar products but with more features at a similar price.

Their engineers had been working on new designs for over a year and they now had a prototype which solved all problems EXCEPT that it was bigger, heavier and cost more than the current IWFA to manufacture.

At this point their engineering team came to learn TRIZ, and they brought to the TRIZ workshops the redesign of the IWFA, their most pressing problem. Together we systematically applied the TRIZ process and tools to finding a better design.

During their five days of TRIZ the client's engineers came up with a new version of the IWFA which is to be launched soon.

This new IWFA is:

- smaller
- more powerful
- more robust
- more flexible
- more effective and less expensive than current model
- **and reduced manufacturing costs - particularly labour by 50%**

The cost savings to the company were estimated to be hundreds of thousands of pounds and the impact of the new design was immediate.

The following is how the problem was mapped in the Oxford Creativity Problem Pack and how their engineers used TRIZ to solve the IWFA problem and subsequent problems associated with launching any new design.

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STEP ONE – State the Problem? (or what do we think it is)

Problem with Industrial Worldwide Fire-Alarm (IWFA) is that current design of IWFA is out of date and sales are decreasing – The current design has a number of problems:

1) Too big (this will be critical to future sales)
2) Too complicated & too expensive to manufacture
3) IWFA is wired into a number of detectors – new detectors are being installed which need more power – beyond the capacity of IWFA
4) IWFA does not meet the new safety regulations
5) It is not loud enough
6) It sometimes has to be installed on site by non-experts. As it is connected to a number of detectors – assembly and installation needs to be simple and foolproof
7) It has to be robust to withstand industrial pollution and atmospheres
8) Rival models have more features

STEP TWO- What do we want?
In TRIZ we try and make sure that we can see the wood for the trees, and to do this we have to understand the big picture AND all the technical details (without getting lost in these details). The TRIZ tool for this is **Ideal Outcome,** to understand **what we want** without getting bogged down in constraints.

The Ideal Outcome is a definition of benefits only. It helps us see what we want without thinking about HOW we get those benefits; it's not supposed to be a practical solution – just a magic wand. We defined Ideal Outcome for the engineers and the company and for all other stakeholders.

2.1 What do we want? (and who are we?)

The Company wants: - (Ideal Outcome)
To maintain and increase their market share
More profit
To get lower manufacturing costs for a better product which satisfies market demands

The engineers want (Ideal Outcome) a design for a new IWFA which:-
Is an innovative step-change in design
Is better than the current IWFA and meets all technical needs
Satisfies customer demands
Is more powerful
Has more features
Has lower manufacturing costs

and they don't want
Needless Complexity
Risky new products
Uncertainty
High costs

2.2 Conflicts between stakeholders

What we want and what our customers want may be different. Using TRIZ to resolve the conflicts between stakeholders' needs should point us to the broad directions for future products.

The company had already undertaken research on customer requirements. All we needed was to map these in detail. This step is often missed out but is critical if we want to understand what our customers really want. This can be covered thoroughly, systematically and quickly by using the Oxford Creativity Stakeholders' Worksheet. Not only does it deliver fast and accurate results but it also achieves consensus from the participants.

This helped the engineers to define all stakeholders, their requirements and agree how to prioritise them. As the research for this had been done the year before it was felt that the stakeholders' needs were based on fact, not opinion, and were accurate, measurable and could be traced to source. This meant they were confident of their conclusions and results.

Despite this the results from the analysis of the Stakeholders Worksheet surprised the engineers. From these unexpected conclusions they could identify the conflicts between the stakeholders' needs and start to see the very simple but innovative solution to the problem.

2.3 What did the stakeholders want?

CUSTOMER - What did the purchasers of the IWFA want? Their main requirements had been researched and were:-

1) IWFA Small
2) IWFA Robust
3) Totally reliable & last forever
4) Instant installation
5) No maintenance
6) Only pay for what they want
7) Lots of features available
8) Easy upgrades
9) Meets all regulations (even those in future)
10) Fits available space
11) Always signals fire

Etc.

SUPPLIER - What did the designers and manufacturers of IWFA want?

1) A brilliant device that was easy to install. ……
2) Small
3) Cheap to make
4) Robust
5) Unique (better than all competitors)
6) Never fails for life of product
7) Single product to suit all customer requirements
8) Easy manufacture, installation and maintenance

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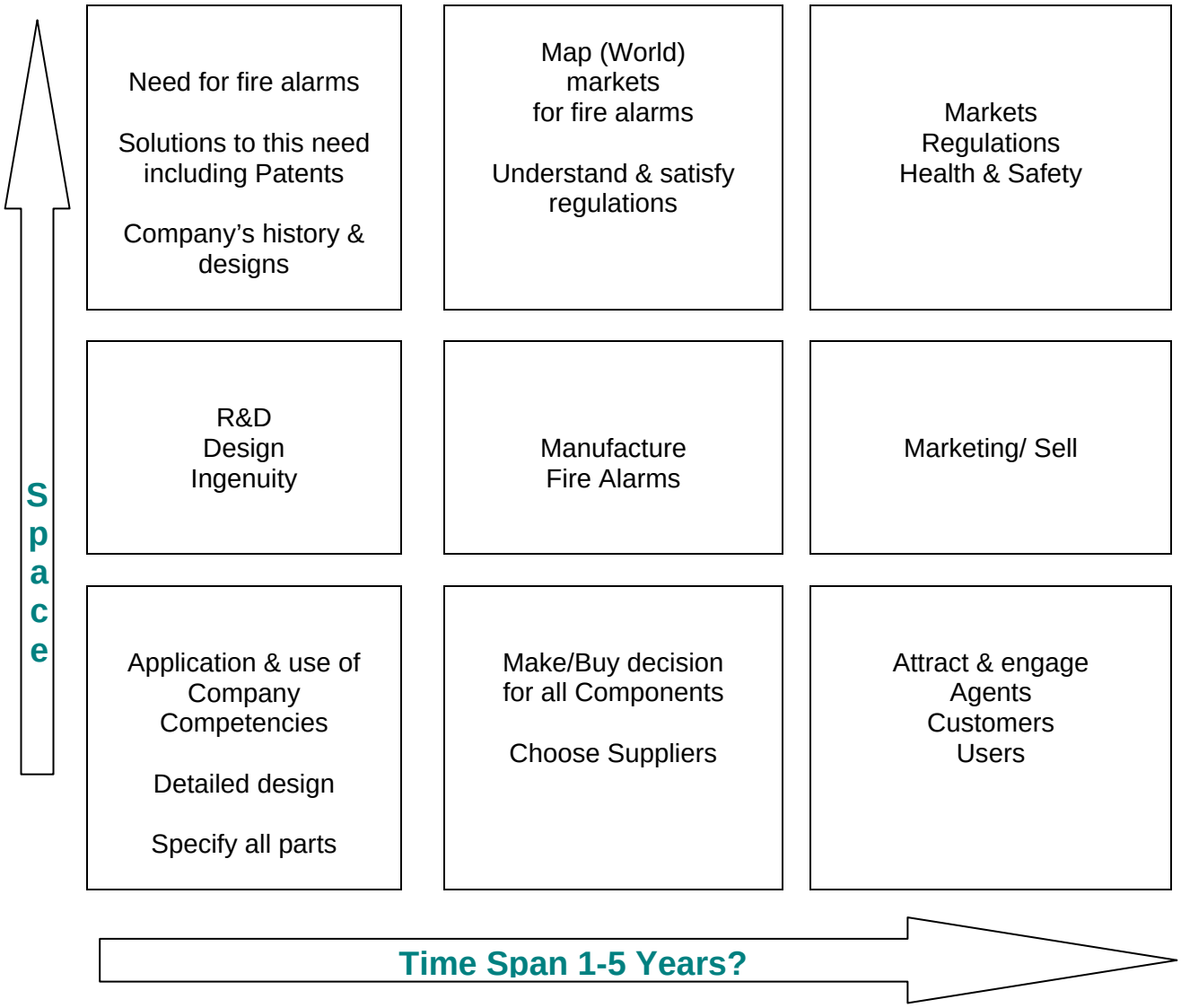
2.4 Understanding how different Stakeholders' requirements vary in Time & Space and how to please everyone (well almost everyone)

By thinking in Time & Space the IWFA engineers saw that they were only concentrating on one aspect and one stage in the IWFA and once they mapped all the stages, they saw what was needed. They then used the TRIZ tools for solving contradictions to find solutions. Below we show how by thinking in Time and Space we solved the problem. The diagrams show all the stages and the different requirements of all interested parties in a simple way.

Stage One – Make Fire Alarms to satisfy Market Needs



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Stage Two – Install Fire Alarms on industrial site

Access premises Prepare site for installation	Who Installs?	Procedures if fire
Uninstall current fire alarm Set up to install new alarm	**Install Fire Alarms Quickly and easily** Connect to detectors Switch on	Check it works In situ In fire situation
Define requirements Follow /read instructions to check or install relevant detectors	Fire detectors wired in Alarm set Meet all requirements	Check all detectors

Time Span 1-5 hours?

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Stage Three – Fire Alarms in place in case of hazard

Meets all Regulations Set Procedures	Factory reacts if alarm is set off Procedures implemented	Procedures applied if fire
Service / Maintain IWFA Sell upgrades	Ensure Fire Alarms work well Self Test Obvious displays if fails	Reset if used
Check / Test all circuits	Fire detectors wired in Alarm triggered if necessary	Check all detectors Fault diagnosis

Time Span 10-15 years

What was the unsolved problem?

It must be designed for fast, accurate and easy installation.

How had the IWFA engineers solved the challenges for installation? They made the device BIG to make all wiring etc. easy. But when they looked at their Time and Space diagrams they realised their solution to 'Easy to Install' of making it BIG was a good solution for the few hours when they it was installed but a very bad solution for the next 10-15 years when it was in use.

In this way the TRIZ process makes us first examine what we want (benefits) and then check all the ways (features) we can deliver those benefits. It is important not to jump forward to features – the traditional asking WHY? WHY? WHY? is to get us back from features to benefits.

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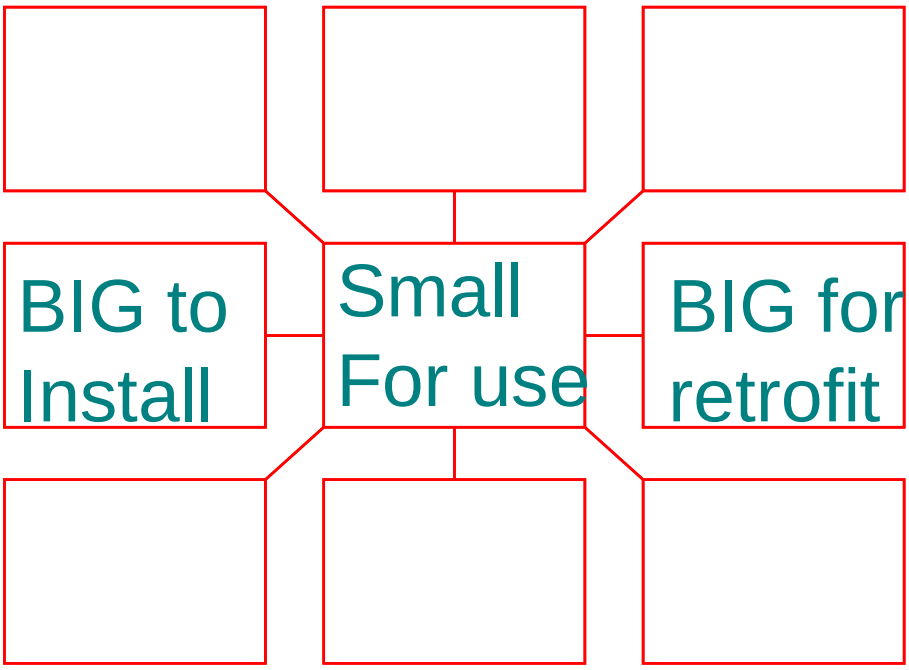
So WHY is it BIG? To make it easy to install. So **what we want** is **easy to install** – one solution to this is to make it big – a good solution for only a few hours but a very poor solution for all the years the product is in use.

TRIZ Tools for understanding what we want and then how to get everything we want

It took our Time & Space diagrams to get to the essential question - what do we want? The answer is of course EASY TO INSTALL. But without the TRIZ process we had jumped forward and chosen BIG, although with hindsight we can now see that BIG was only one way of getting easy to install. However obvious to everyone now BIG was a solution the engineers had stuck with for over 10 years of the old design, and another year working on the new one. Now they had the right question we could use TRIZ to get the right answers.

BIG was only one solution for providing easy access for wiring. How else can we get that?



This was obviously a Physical Contradiction which could be Separated in Time.

The suggested TRIZ Solutions for this included the TRIZ Principles of Dynamics and Prior Action. Dynamics suggested that they should use a simple folding design which can be big for install or retrofit but folded for a compact and small device when in use.

Like all TRIZ solutions this is a self-evident and an obvious solution when we see it. But after a year in redesign and despite a team of highly motivated and clever engineers working hard on the problem they had not solved it.

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Once their engineers used the TRIZ tools of Thinking in Time & Space and solving contradictions they had their answer - an answer which saved over 50% of manufacturing costs and gave their customers a better product.

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