

# Full Spectrum Innovation

## The TPP Cascade – A tool for the Fuzzy Front End of Innovation

One of the biggest challenges we find in innovation is managing the Fuzzy Front End<sup>1</sup> – that complex challenging space at the earliest stages of innovation. Often, we come across organisations with a broad brush understanding of what they intend to develop, but find it difficult to articulate it in detail.

This becomes even more of a challenge as innovation becomes more diverse – with a single product needing to successfully integrate a wide range of disciplines and outlooks. How do we move from the ‘feel’ of what’s needed to something concrete, whilst maintaining a creative approach? How do we ensure everyone is aligned around the same mission, though they come at it from different directions? Moreover, how do we ensure that what we deliver meets the customer need, and not simply our perception of it?

### The TPP Cascade

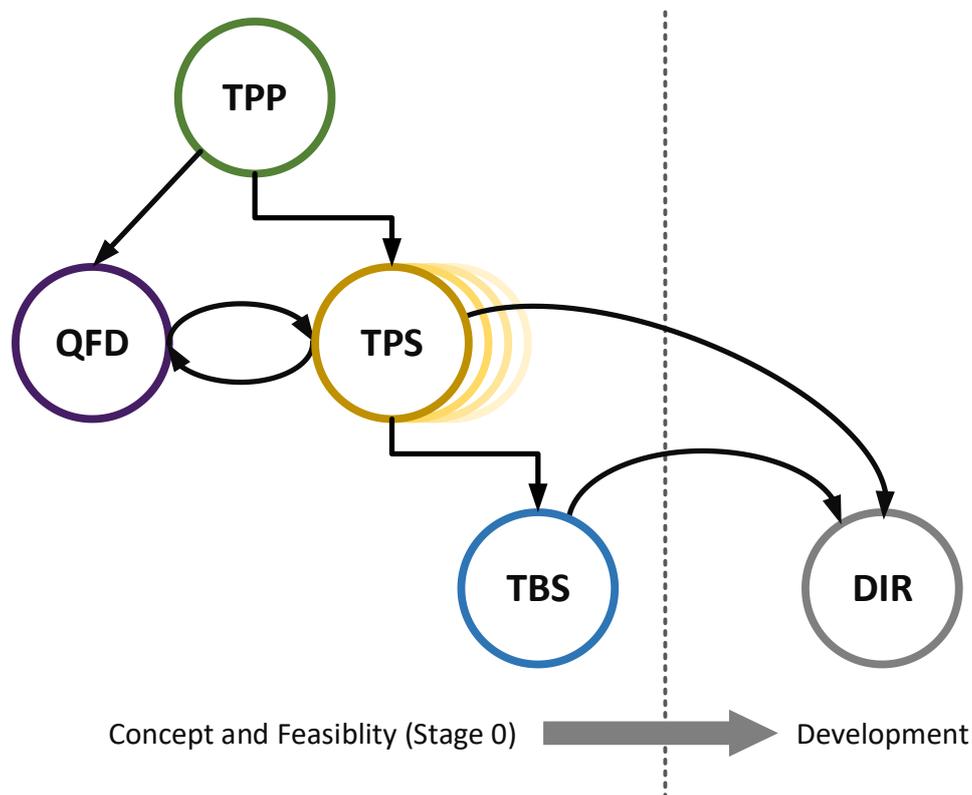


Figure 1: The TPP cascade

A way we’ve often addressed these challenges is through the use of a TPP cascade. The requirements, needs and research required in the early stages of a project are often hard to capture in a quantified form. The TPP cascade addresses this via introducing a staged process of definition, from top level target down through various levels of detail (from cloud to concrete). At the same time, it is structured to build a common understanding (mission) among diverse disciplines and functions, support creativity in the earliest project stages, and ensure that customer needs are understood and met as the project priority.

A key to the success of the TPP cascade is that it operates in what we call the Stage 0 of a project – focusing on concept and feasibility, and sitting before formal design controls, whilst still implementing a strong quality management approach. It is in essence an information gathering and decision-making framework, which leads directly into, for example, the formal design input requirements which kickstart good development processes.

As you move through the process, in the first instance it defines the overriding goal/mission of the project in terms of the intended performance features - directly referencing the market need. In the second instance it provides a way to objectively assess potential solutions/concepts against that goal. Then finally, it translates the identified concepts into real specifications – design input requirements. Each stage of the process is discussed in detail below.

### **TPP – Target Product Proposal**

The TPP in this structure defines the *intended performance features* of the system. It is in essence a statement of intent, with the core focus being the value differentiating features, expressed in terms of their benefit to the customer/stakeholders. Though it may also include ‘must have’, but non-differentiating factors, they’re equally not the main point of the exercise. Instead, the main point is to deeply investigate the needs of the customer, and define what performance the product will deliver for them.

A good touchpoint is pharmaceuticals – we’re defining the therapeutic outcome and patient benefit, over how it is achieved. We define at this stage the improvement for the patient, but critically not how it comes about. In fact, the TPP works best when it is ‘agnostic’ as to how a particular outcome is achieved – only that it satisfies a clear (and well-researched) user/patient/stakeholder/market need.

Splitting the ‘What’ from the ‘How’ here is crucial, for two reasons. Firstly, it allows us to focus entirely on what the customer needs, and avoid in the early explorative stages being limited by that is *considered* to be possible before deeply investigating it. Secondly, this ‘What’ level is something nearly all functions and disciplines are able to engage with – existing at a strategic level above e.g. mechanical or electronic design. Therefore, the team as a whole are both able to contribute to and commit to delivering a clear project ‘north star’ – a definition of success around which all are aligned.

### **TPS – Target Performance Specification**

The Target Performance Specification then sits below the TPP, and is the first stage in defining *how* each outcome will be achieved – via an identified scientific/technical principle, or mode of action. Its aim is to describe the mechanism(s) by which each of the TPP performance features could be achieved.

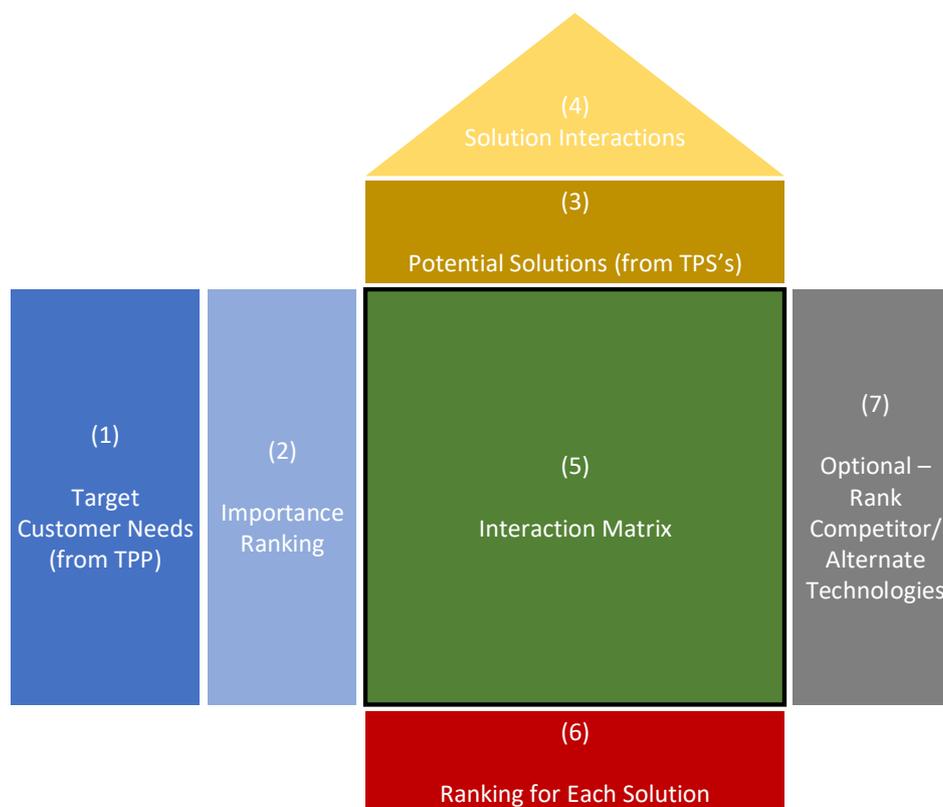
The split between ‘could and ‘would’ at this stage is crucial. In the explorative early stages of innovation, we in fact want to develop several TPS’s – each a holistic combination of alternate ways of achieving the TPP. Broadly it identifies which MoA’s are conceptually possible/desirable for each TPP element - which are then investigated/verified as part of concept and feasibility experimentation.

The advantage of this approach is that not only does it give the team room and permission for creative problem solving – hugely effective when combined with team co-creativity building techniques - but it also clearly identifies technical information gaps. This allows the team to conduct well targeted research and experimentation that produces an objective basis for each design decision – leading to well-founded designs and good quality management. After any research/experimentation is complete, each MoA is assessed against each other via QFD to produce a single, final, TPS for the product.

## QFD – Quality Function Deployment

QFD<sup>2</sup> is an assessment method that links the market-led need to the scientific background, and the technical MoA's in the TPS's. It represents an open, objective and quantified assessment of the best route to take for realising the TPP – based on the relative importance of performance features, the quality of a particular solution, and the ease of implementation. A weighting system is used to compare the relative benefit/importance of each TPS element – narrowing down the various TPS options to a core target.

Importantly this is not a replacement for creativity during the early stages of an innovation project, but intended to objectively assess the outcomes of a highly creative process against the clearly defined customer need. It is intended to be a process all of the team are able to engage with – integrating their diverse viewpoints around a common understanding of the need, and possibilities. As before, this objective approach, whilst allowing large creative freedom at the early stages, is also a high-quality foundation for quality management, and later design controls.



**Figure 2: The QFD**

## TBS – Technical Build Specification

The TBS is the first stage in turning the MoA's in the TPS into detailed design requirements – and describes in detail how a particular TPS – typically the final TPS – can be achieved. Its completion also marks the transition from concept and feasibility into research and development – as well as the introduction of e.g. design controls. The design input requirements themselves come partly from the TPS and TBS, but also from wider sources such as regulatory requirements. Critical in all cases is that the requirements are 'real', tangible and measurable.

## Summary

The TPP cascade then represents a structured approach to the early ‘fuzzy front end’ of innovation that guides the creation of a clear ‘mission’ without sacrificing creative latitude and the capability to explore. In fact, the approach is able instead to effectively guide creative effort to clearly identified key questions, whilst focusing team co-creativity around a clear well-defined target.

The TPP does this by carefully stepping (or cascading) down through ever deeper levels of detail – from cloud to concrete – with the highest level focused exclusively on customer benefits and the ability to engage the whole team. For further guidance, Table 1 outlines the conceptual level at each stage – using the development as a new car as an example.

Level	Target	Example
TPP	A high-level description of what the product is intended to deliver in customer terms	Pleasant driving experience, safe in wet weather, good handling, good quality look and feel, etc.
TPS	A high-level description of how each TPP can be met, including, e.g. the Mode of Action	Driven by high power Wenkel engine, Ceramic disc-brakes providing improved breaking
TBS	A detailed description of how to achieve a particular TPS – using concrete verifiable requirements	Wenkel engine has a 1.3L capacity, fuel injection rates are 20mg/shot

**Table 1:** The TPP cascade - examples

Secondly the process also explicitly includes the creation of a number of concepts for addressing the TPP, as well as a method for objectively assessing each against each other, and competitive products. All in all, this produces design concepts which are well targeted to the customer needs, are well justified in terms of their feasibility and value, and have strong foundations in terms of quality management and design control.

Finally, and most importantly, the TPP cascade is an effective tool for taking the fear out of the fuzzy front end of innovation, helping us feel less overwhelmed by uncertainty, and guiding us from cloud to concrete in a way which gives an innovation project the best start it can have. Yet innovation is never ‘one-size-fits-all’, and we encourage organisations to adapt all processes to their own context, culture and needs. The TPP cascade then is one of many tools FSi use to help organisations innovate – please contact us to discover more.

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## References

- 1 - Gassman, O., Schweitzer, F., 2014. Managing the Fuzzy Front End of Innovation, Springer International Publishing
- 2 - Akao, Yoji and Mizuno, 1994. QFD: The Customer-Driven Approach to Quality Planning and Deployment, Taylor and Francis