QUALCON / APQO 2021

THE FUTURE OF QUALITY IS NOW!

Quality in the balance? Competing in the age of black swans and grey rhinos

Nigel Grigg

What topics do I now include in a QM course?

Why is Quality Management (and quality managers) becoming decoupled from process improvement?

What subjects are (in)appropriate for inclusion in a QM journal

Where does QM stop and operations or supply chain management start?

Are the quality gurus still relevant in the era of *Industrie 4.0* /Quality 4.0?

Are quality and process improvement becoming decoupled?

Continuous Improvement Advisor

[redacted]

[redacted]

Manufacturing, Transport & Logistics > Ot

- Gain exposure to all aspects of our 3PL bus
- Excellent growth potential in a world-leadin
- Be part of a high performing & fast-paced te

Are you looking for an exciting new step in yo
championing continuous improvement? Look

Continuous Improvement Analyst

[redacted]

time Transport

and influence outcomes

the NPDL group.

Process Excellence Coach

[redacted]

[redacted]

Banking & Financial Services > Other

Process Excellence Coach Are you someone who is ready to ensure we deliver great customer experiences through process optimisation?

Continuous Improvement Manager

[redacted]

[redacted]

Manufacturing, Transport & Logistics > Quality Assurance & Control

- Stunning West Coast Location
- [redacted]
- Drive Continuous Improvement Projects & Activities Across the Quality Team

Exciting & challenging role where confidence in the decisions you make & the ability to implement new business processes are the key for your success.

Business Improvement Manager

4d ago

[redacted]

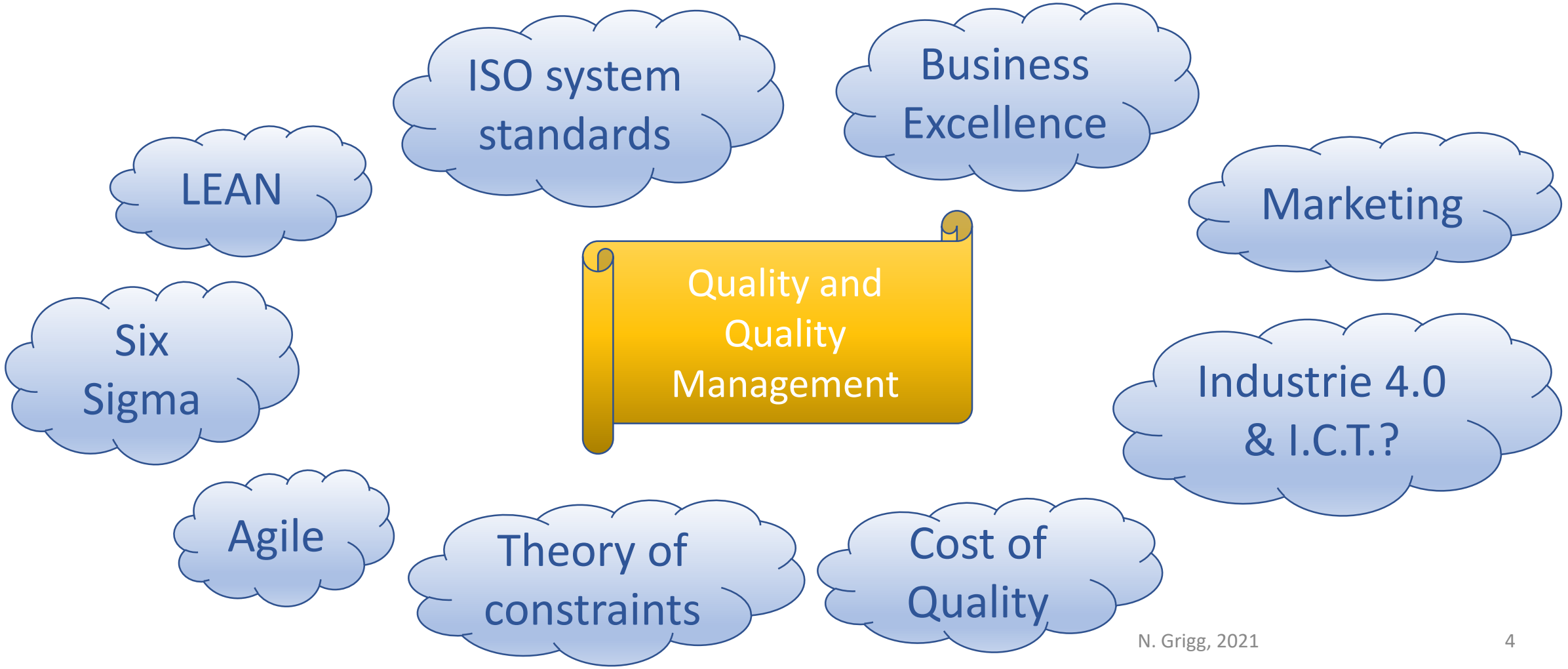
Auckland > Auckland Central

Manufacturing, Transport & Logistics > Rail & Maritime Transport

- Drive a continuous improvement culture
- Help deliver sustainable transport solutions to keep New Zealand moving!
- Wellington, Auckland or Hamilton based

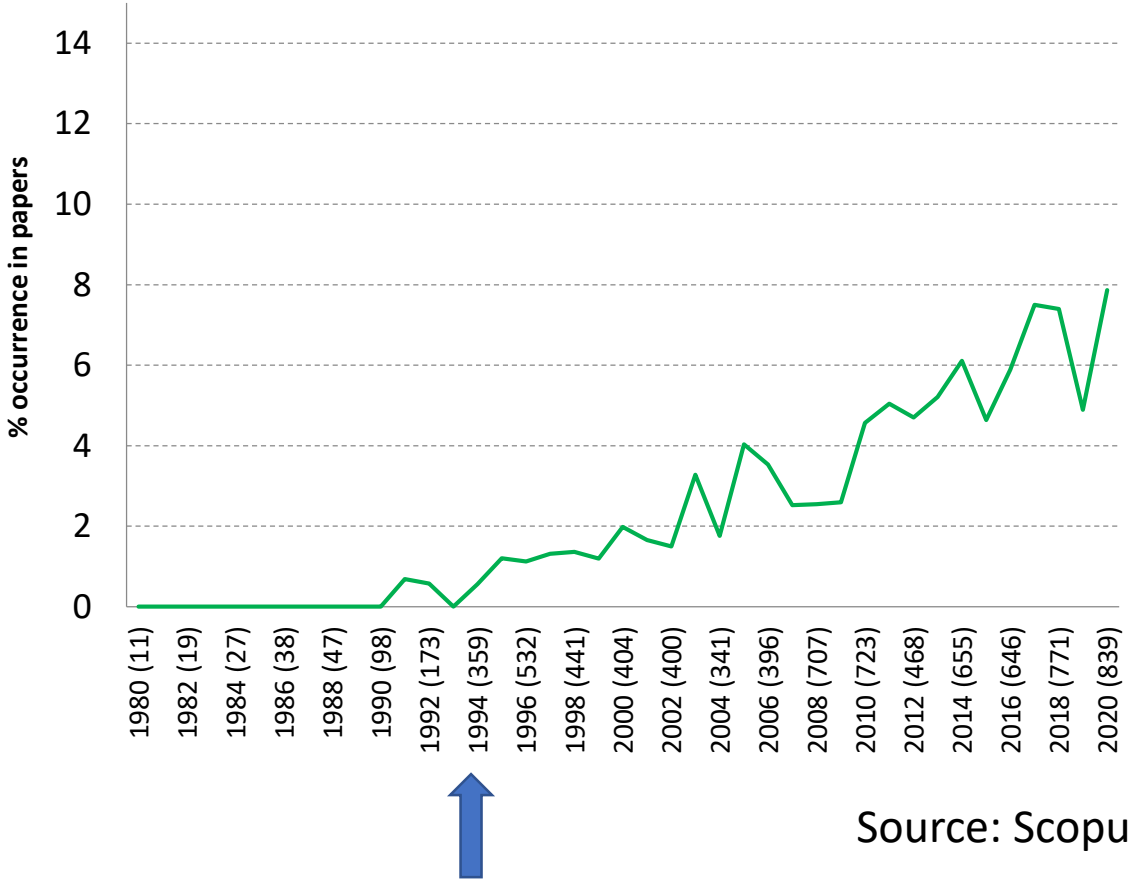
Bring your innovative thinking and change management expertise to create streamlined tools and processes for our Transport Property group.

Where do methodologies and methods such as these fit into quality management?

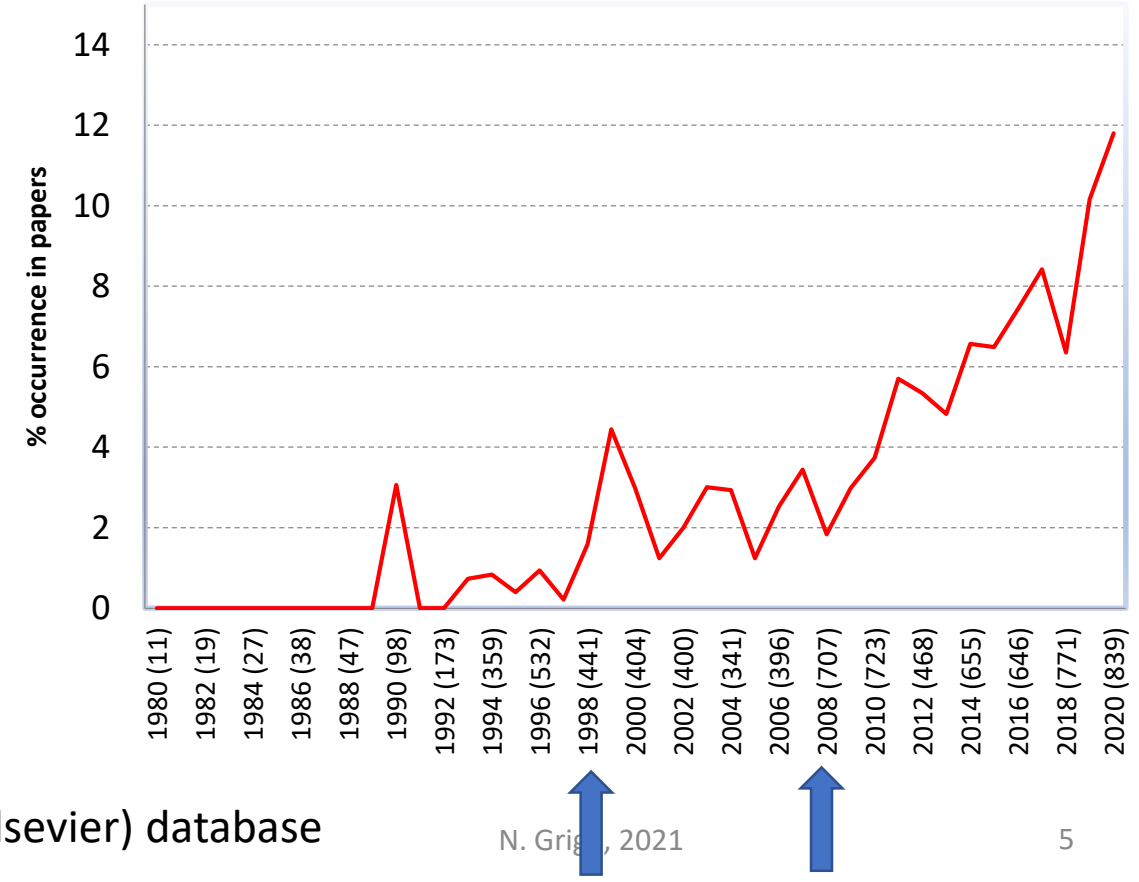


What about these literature trends?

% of academic QM-related papers mentioning ‘value’ concepts



% of academic QM-related papers mentioning ‘risk’ concepts



Source: Scopus (Elsevier) database

Risk context: ‘Black swan’ event

“...comes as a surprise, has a major effect, and is often inappropriately rationalized after the fact with the benefit of hindsight”.

- (Successful) acts of terrorism, piracy, cyber-attacks
- Volcanic eruptions, major earthquakes, tsunami events
- Stock market crashes
- Commercial Aircraft accidents / incidents
- Widespread food adulteration or contamination events
- Viral outbreaks and pandemics

Photo by N. Grigg


Photo by Iewek Gnos on Unsplash

Risk context: ‘Gray *(sic.)* Rhino’

- Highly probable, high impact but probably neglected;
- Not random, occur after warnings and visible evidence.
- How many of those examples listed on previous slide can be anticipated or planned for?
- So, when is an event a black swan, and when is it a grey rhino?
  - Climate change?
  - Pandemics?
  - Seismic events?

Photo by Dušan veverkolog on Unsplash

So what's new?

- Unpredictable, high impact events are nothing new!
- What is new is the extent of impact these can have on trans-national interdependent supply chains.
  - Globalised supply networks
  - Distributed oversight and control
  - Reliance on I.T. systems
  - Many handover points
  - Many local cultures / contexts

Photo by N. Grigg

What does this mean for quality?

- Has catapulted risk / risk management to the forefront of quality standards and models;
- We now know we need to be planning for the unplannable;
- And then there's Industry / Quality 4.0 to consider!
  - disruptive technology
  - cyber-physical systems
  - big data
  - hyper-connectivity

Photo by Stephen Dawson on Unsplash

Value (V), Risk (R) and Cost (C) as core aspects of Quality (Q)

Are they...

...universal?

...different?

...complementary?

...in opposition?

...related to products/services, to production systems, or to customer decisions?

Photo by janilson furtado on Unsplash

The QVRC model (2020)

The current issue and full text archive of this journal is available on Emerald Insight at:
https://www.emerald.com/insight/0265-671X.htm

QUALITY PAPER

Redefining quality in terms of value, risk and cost: a literature review

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Abstract

Purpose – The purpose of this paper is to present a literature review demonstrating that quality and its management are increasingly definable as a balancing act between value, risk and cost throughout the value stream, from product/service design to production and delivery, and purchaser decision-making. An original framework is presented showing this interplay across the value stream, referred to as the QVRC framework.

Design/methodology/approach – Content analysis is combined with bibliometric analytics, displayed via temporal graphs and citation networks. Reviewed literature is transdisciplinary, encompassing marketing, operations/quality and psychology sources. Core quality management methodologies are positioned on the framework illustrating their relative contribution to value, risk and cost management.

Findings – The QVRC framework is developed, and used as a basis for classifying models and methodologies associated with quality management. A set of propositions are developed, which, together with the framework, set an agenda for further research.

Research limitations/implications – No literature review can capture the richness of discourses on terms as pervasive as value, risk and cost. This paper aims to present a systematic and reliable sampling of such literature.

Practical implications – The resulting model can be applied to management tools, and to products and services.

Originality/value – Researchers, particularly in marketing, have developed models of value, risk and cost in terms of products and services. However, delivering products that provide the appropriate value, risk and cost trade-off is an operations management problem. This is the first paper to combine value, risk and cost across the value stream showing how this interplay extends beyond product.

Keywords Cost management, Literature review, Risk management, Value stream, Quality

Paper type Literature review

SHARE

Introducing the QVRC model:

Quality conceptualised as a balance between value, risk and cost

Dr Nigel Grigg
Professor of Quality Systems, Massey University.

1. INTRODUCTION

Risk and Value are terms that have been trending in quality literature over recent years. A recent review of literature spanning one hundred years of writings relating to quality revealed them (along with quality-related costs) to be themes that always underscored much of quality theory and practice. While references to the cost of quality have remained largely consistent over time, however, the concepts of value and risk have substantially increased in their occurrence over the 21st century.

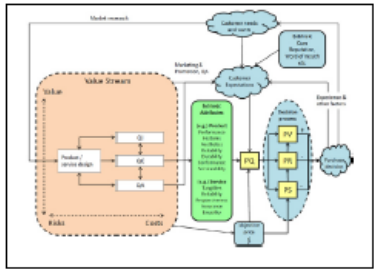
Considering value, Michael Porter first introduced the value chain concept in the mid-1980s [1]. A growth of interest in lean since the 1990s catapulted the term to greater prominence. Since then, the value concept has been widely discussed in reference to the value stream/flow, and the value chain has been reinvented to refer to the complete product life-cycle.

Considering risk, events such as: the 'Y2K' fears; the 2008 Global Financial Crisis; the 2012 European beef supply chain scandal and major product recalls; and now the global disruption created by COVID-19 lockdown have propelled risk to the very forefront of management concerns. However, risk is not new and has always been a primary concern of quality management (QM). Risk has been identified, reduced and managed through variation reduction, regulatory compliance, quality systems and procedures, and formalised tools such as FMEA (Failure Modes and Effects Analysis). Nevertheless, ISO 9001 and ISO 31000 have over recent years further explicitly emphasised the vital importance of adopting risk based thinking.

The third element (cost) has always been either implicit or explicit within early writing on the economics of quality by quality pioneers such as Shewhart, Dodge & Romig, Deming, Juran, Feigenbaum, Crosby and many others.

The literature analysis led to a re-conceptualisation of quality as a dynamic, tripartite balancing-act between creating and delivering customer value, while controlling and reducing risks, and managing costs across the entire value stream from design through to the purchase decision and beyond. This paper presents and describes the resulting model, referred to as the QVRC (Quality, Value, Risk and Cost) model. The paper will explain how to read the model, and its potential applications (value) for quality managers. The model is reproduced as figure 1

Figure 1: The QVRC Model (Grigg, N., 2020 [2])



Legend: QA = Quality Assurance, QC = Quality Control, QI = Quality Improvement, PQ = Perceived Quality, PV = Perceived Value, PR = Perceived Risk, PS = Perceived Sacrifice

2. THE PRODUCER SIDE (LHS) OF THE MODEL

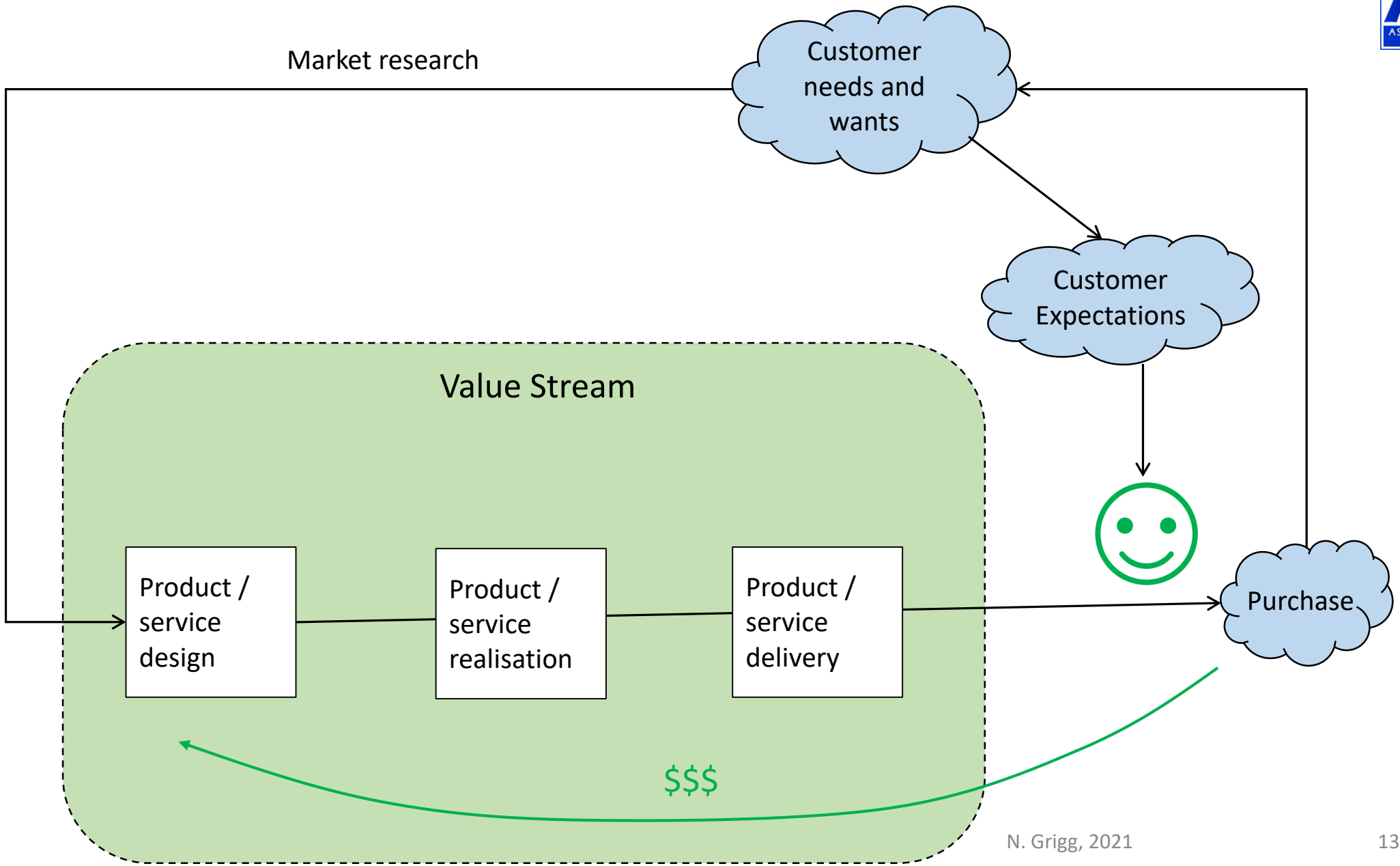
Beginning on the producer (light orange, left hand) side, in designing a product or service the producer is aiming to create something that can be produced or delivered, and that a customer will want to pay for. The design process aims to

Starting point: what *is* quality?

- Many formal definitions exist, all are good / relevant.
- Surely it is establishing what someone wants from you, and delivering it to them as, and when, they *expect* it.
  - i.e. right product, right place, right time, right quantity, right quality, right price;
- 'Someone' can be a customer, stakeholder, shareholder, patron, sponsor, funder...
- One or more of these entities supplies money that flows down the supply chain, financially sustaining the organisations (and people) that are part of it.

Photo by N. Grigg

An initial model



But people are individuals...

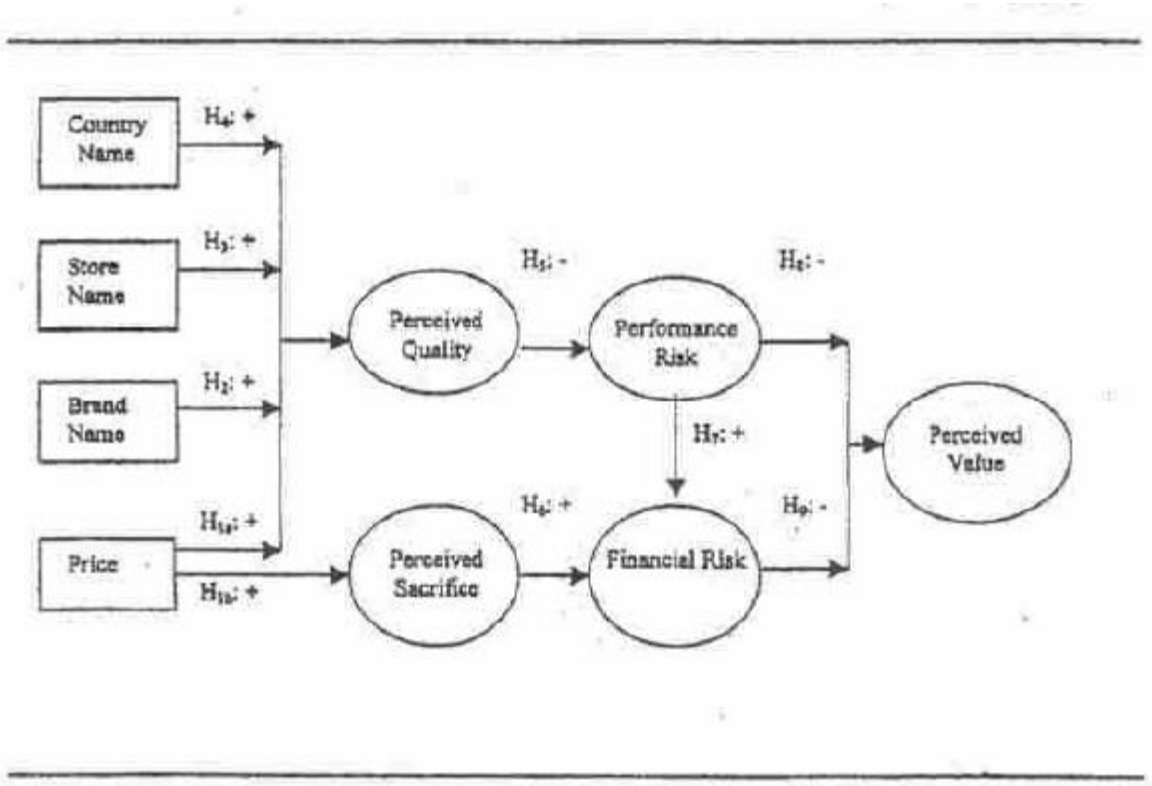
- So everyone's *perception* of your product or service is slightly different, as is their *expectation*.
- Prominent developers of quality and marketing theory have referred to this as 'perceived quality' (PQ)
- PQ is a concept that has been bundled-up with perceived value (PV), perceived risk (PR) and perceived 'sacrifice' (PS)

naassom-azevedo-Q_Sei-TqSlc-unsplash

Perceived quality, value, risk and sacrifice

There are many models showing the relationship between perceived quality and perceived value, risk, sacrifice.

- Perceived value = the perceived utility or worth of a product of service
- Perceived sacrifice = what you must give up to buy or use the product or service (partly cost)
- Perceived risk = the potential risk associated with buying or using the product or service (partly cost)

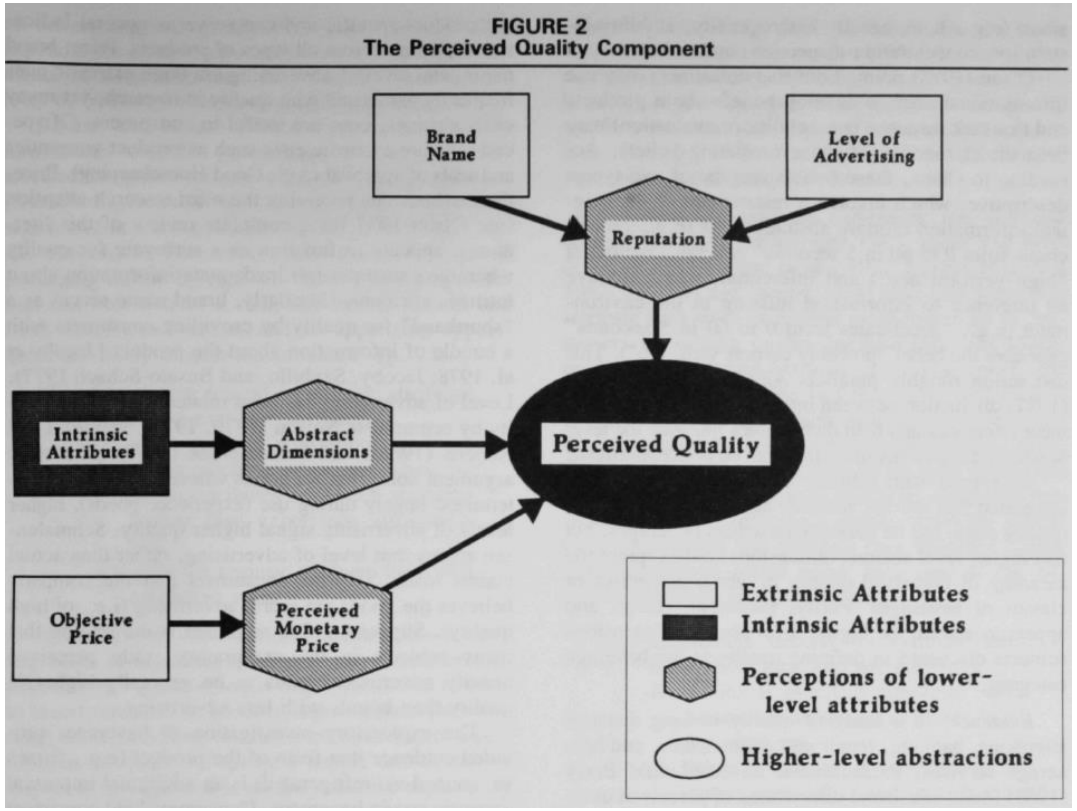


Agarwal & Teas, Journal of Marketing, 2001

Perceived quality, value, risk and sacrifice

Here, Valarie Zeithaml presents some factors that feed into the perception of quality, these are:

- *Intrinsic* to the product or service
- *Extrinsic* – separate from the product or service
  - Price
  - Reputation (brand and advertising)

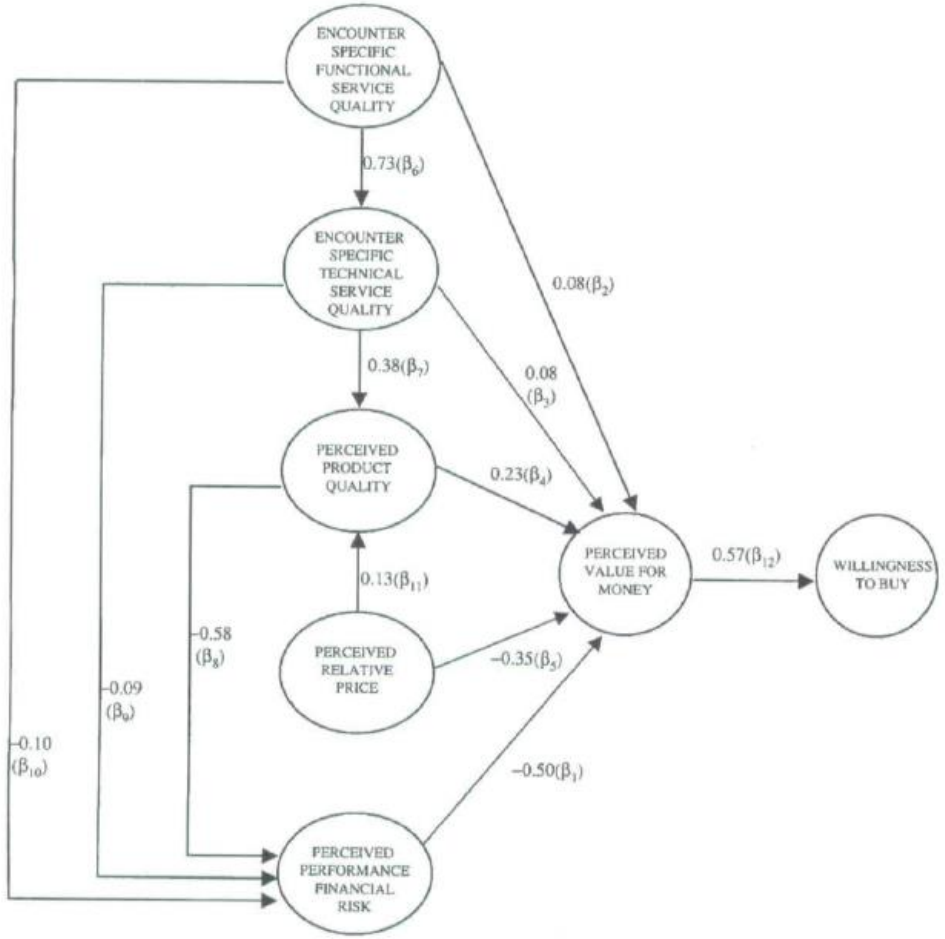


V. Zeithaml, Journal of Marketing, 1988

Perceived quality, value, risk and sacrifice

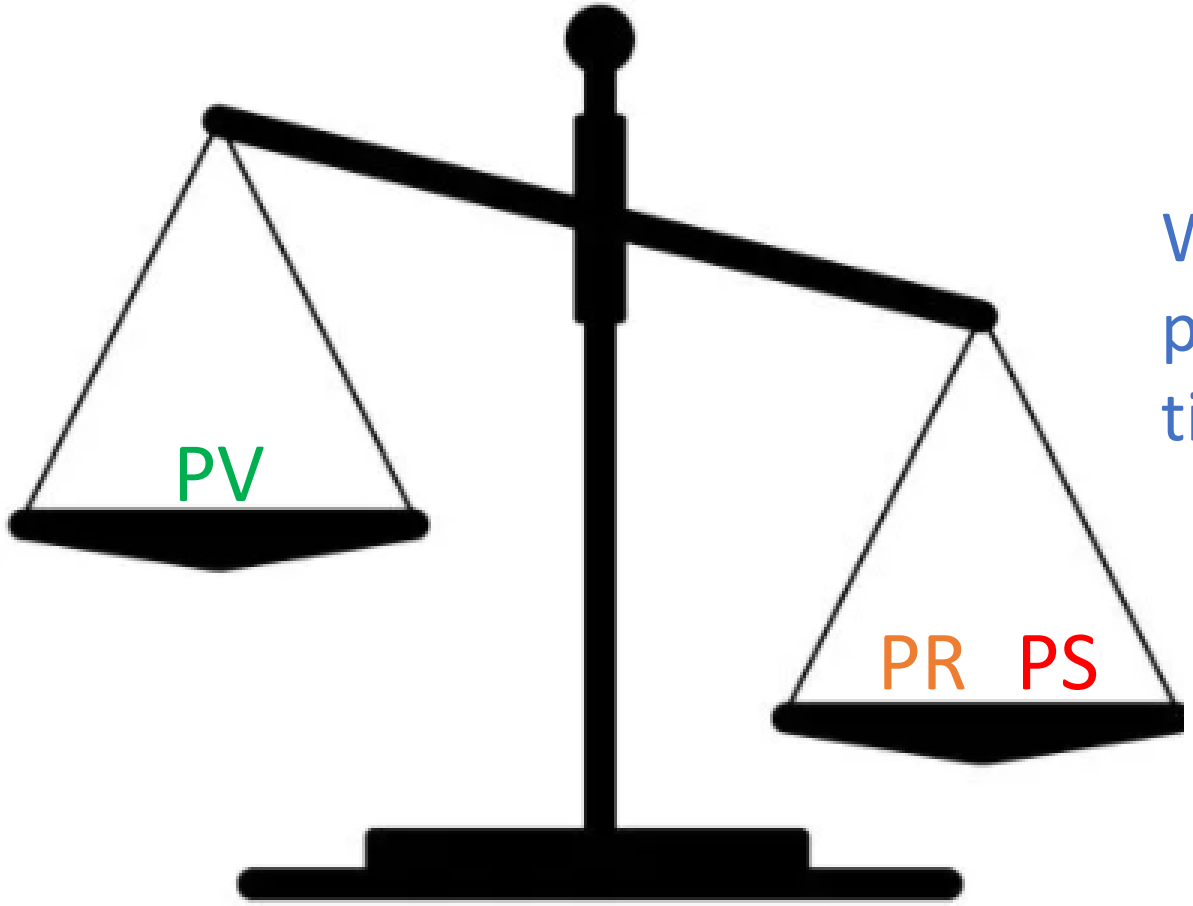
In this model, 'willingness to buy' is a function of perceived value, which is a function of

- Service quality;
- Perceived product quality;
- Relative price; and
- Perceived Risk.



Sweeney, Soutar and Johnson, Journal of Retailing, 1999

In simple terms...



Which way does a product or service tip the balance?

Some interesting examples...

Fugu (Japanese puffer fish)

V, R, C	Nature	Relative Rating
Value	• A great delicacy • Exclusive • ”Thrilling” (Elite Magazine)	Medium-High
Risk	• ...potentially fatal	Medium
Cost	• 3000 to several thousand yen	High

Photo by Stelio Puccinelli on Unsplash

Photo by Y S on Unsplash

Extreme adventure sports (e.g. climbing Mt. Everest)

V, R, C	Nature	Relative Rating
Value	• The ultimate self actualisation? • An exclusive club	High
Risk	• Dangerous, potentially fatal (the danger becomes part of the value)	High
Cost	• >$50,000	High

Photo by Mari Partyka on Unsplash

Photo by P. Childerhouse

Cashmere (Pashm)

sustainability
MDPI
Article

Sustainability Issues in the Traditional Cashmere Supply Chain: Empirical Evidence from Kashmir, India

Sheikh I. Ishrat [1,*], Nigel P. Grigg [2], Carel N. Bezuidenhout [2] and Nihal P. Jayamaha [2]

V, R, C	Nature	Relative Rating
Value	• The intrinsic value of cashmere lies in the fineness of the fibre (high value).	High
Risk	• The risk with cashmere is that you may be getting some proportion of synthetic fibre. • The value chain for cashmere is difficult to fully control (medium risk).	Medium
Cost	• Labour intensity and geographical rarity makes it valuable (and expensive – high cost).	High

Clip by N. Grigg

- Similar issues exist with products such as Mānuka honey that can be counterfeited.

Addictive substances or habits

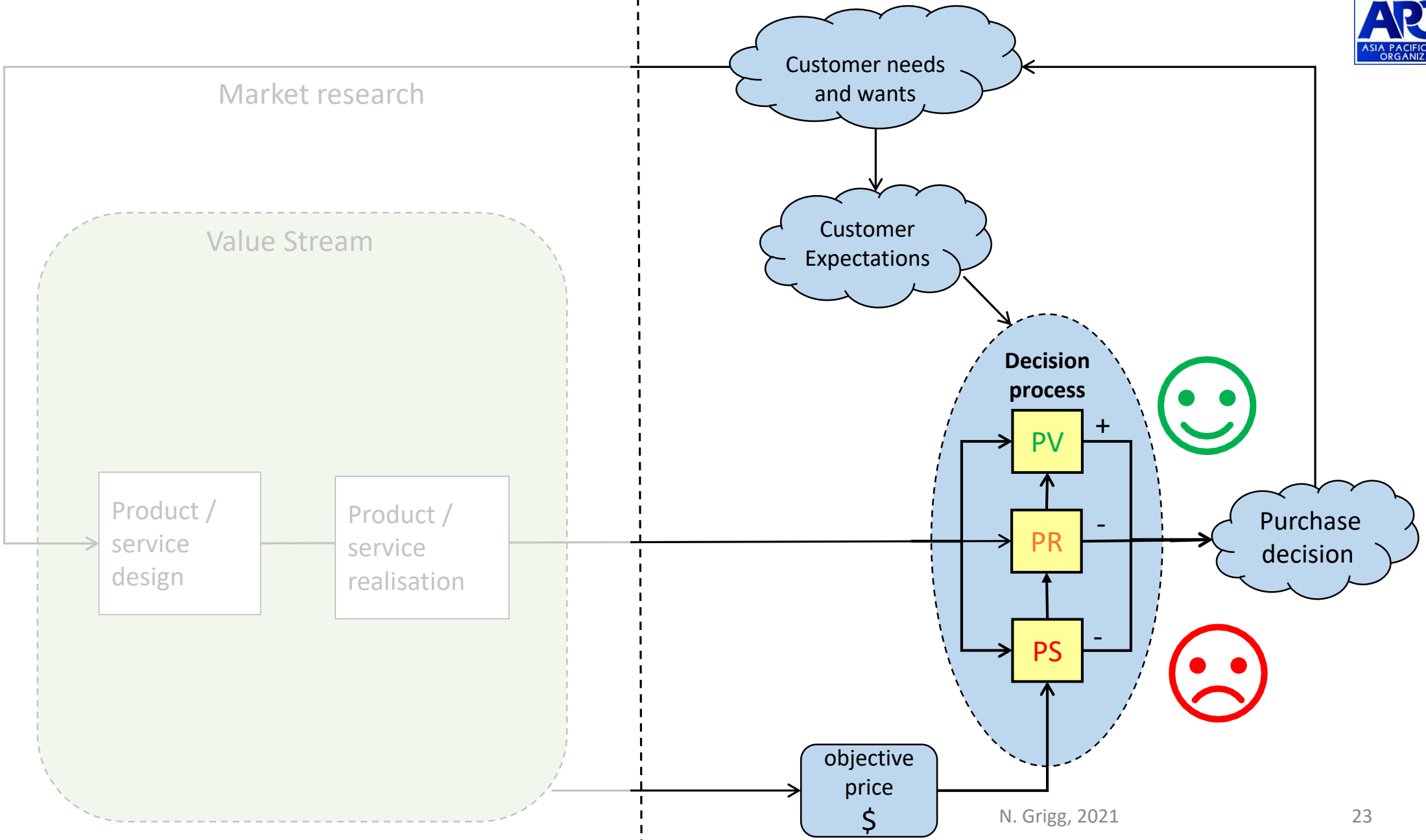
(Gambling, smoking, drug abuse, pornography, opioid medication dependency, alcohol, excess food, compulsive mobile device usage).

V, R, C	Nature	Relative Rating
Value	• Pleasurable (at the time) (medium value) • A release	Low - Medium
Risk	• Detrimental to health and wellbeing • Alienating of society, friends and family	High
Cost	• Expensive (in the long term)	High

Photo by Damir Spanic on Unsplash

Photo by Mikail Duran on Unsplash

QVRC Model – The demand side



QVRC Model – the demand side

There are additional cues, of course. The customer's decision will be influenced by other extrinsic and intrinsic cues

Intrinsic (product/ service) attributes

For products:

Performance
Features
Aesthetics
Reliability
Durability
Conformance
Serviceability
Safety

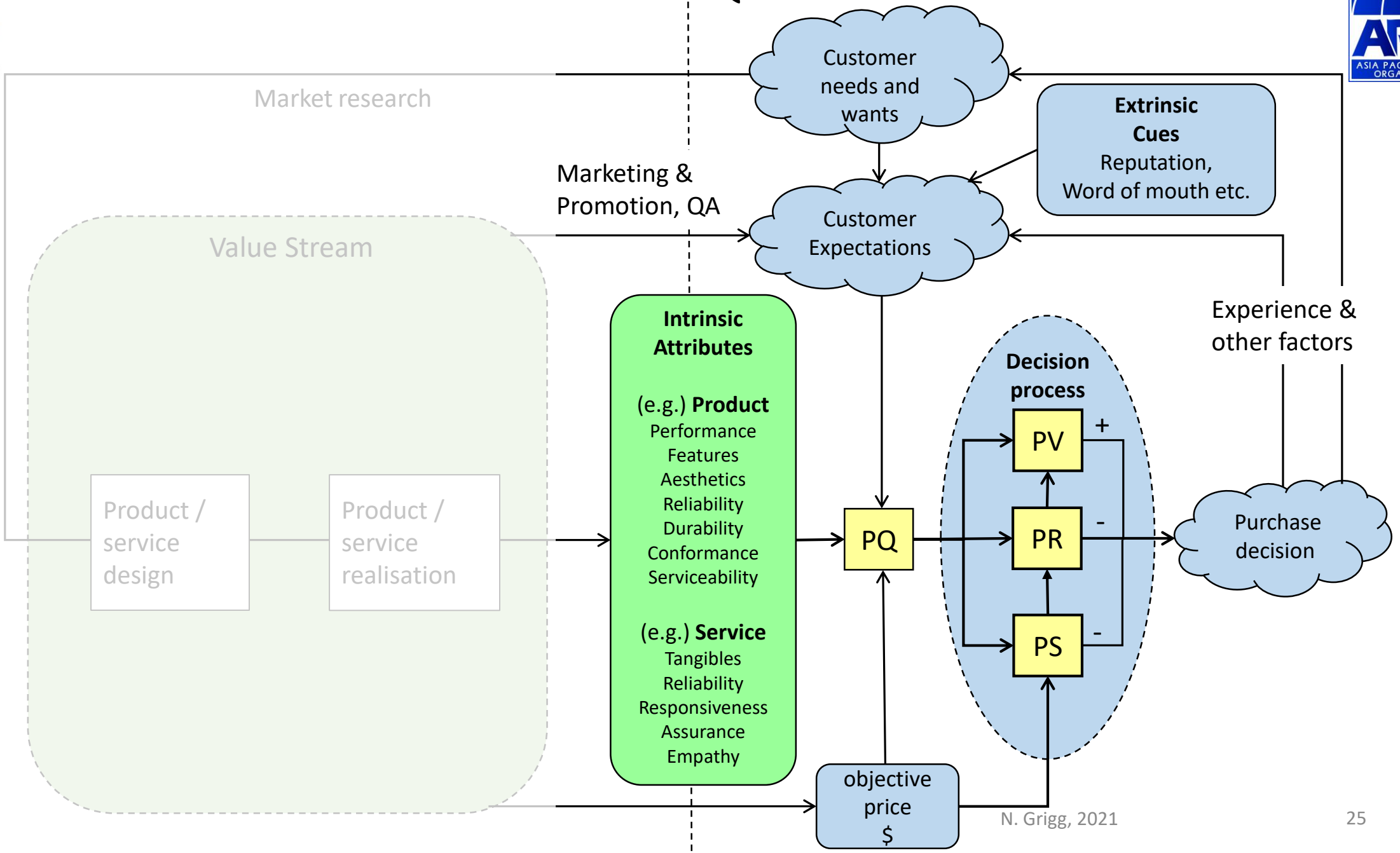
For services:

Tangibles
Responsiveness
Assurance
Empathy
Service providers

Extrinsic cues

Organisational reputation
Past experience
Word-of-mouth comms
Advertising and promotion
Objective price

QVRC Model – The demand side



Supply (producer) side

- The value chain needs to ...
  - Understand the customer value, risk and cost balance (market information and research);
  - Deliver the requisite value, risk level and pricing options to meet the market expectations;
  - Manage the process such that the risk and cost are managed to the level that is required under legal and regulatory requirements.

Managing Cost

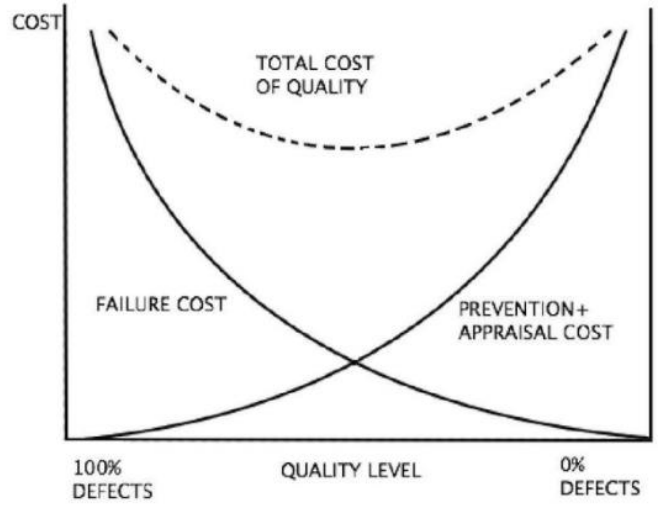
Economic Quality Control of Manufactured Product [1]

By W. A. SHEWHART

Economic quality control has been a central pillar of quality management since the early 1900s

Notable examples over time:

- FORD, H. & CROWTHER, S. 1922. *My Life and Work,* Garden City, N.Y., Doubleday, Page & Co.
- SHEWHART, W. A. 1930. Economic Quality Control of Manufactured Product. *Bell System Technical Journal,* 9**,** 364-389.
- DODGE, H. F. & ROMIG, H. G. 1929. A method of sampling inspection. *Bell Systems Technology Journal,* 8**,** 613-631.
- JURAN, J. M. 1951. *Quality Control Handbook,* New York, McGraw Hill.
- FEIGENBAUM, A. V. 1956. Total quality control. *Harvard Business Review,* 34**,** 93-101.
- TAGUCHI, G. & WU, Y. 1979. *Introduction to off-line quality control,* Tokyo, Japan, Central Japan Quality Control Assoc.
- BS 6143-2:1990 *Guide to the economics of quality*, British Standards Institute
- DEMING, W. E. 1993. *The New Economics* Cambridge, MA., MIT Center for Advanced Engineering Study

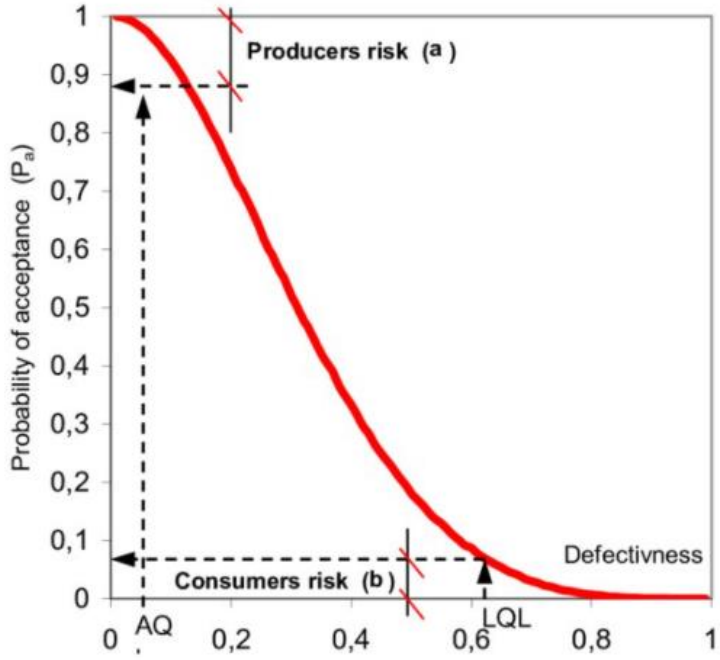


Behzad Abbasnejad, *Poor Quality Cost in Construction*: Literature Review, August 2013, ResearchGate, DOI: 10.13140/RG.2.1.2232.1683

Managing Risk

- Risk was a feature of early acceptance sampling plans (late 1920s), which guarded against consumer's risk and producer's risk.
- A core element of Failure Mode and Effect Analysis (c.1949)

  USDD 1949. MIL-P-1629 – *Procedures for performing a failure mode effect and criticality analysis*. MIL-P-1629. United States Department of Defense.
- Resurgence around the Millennium and after 2008 'Global Financial Crisis'
- Quality Risk Management (QRM) grown in importance along with Supply Chain Risk Management (SRCM);
- Codified into ISO 31000, ISO 9001 and other management system standards.

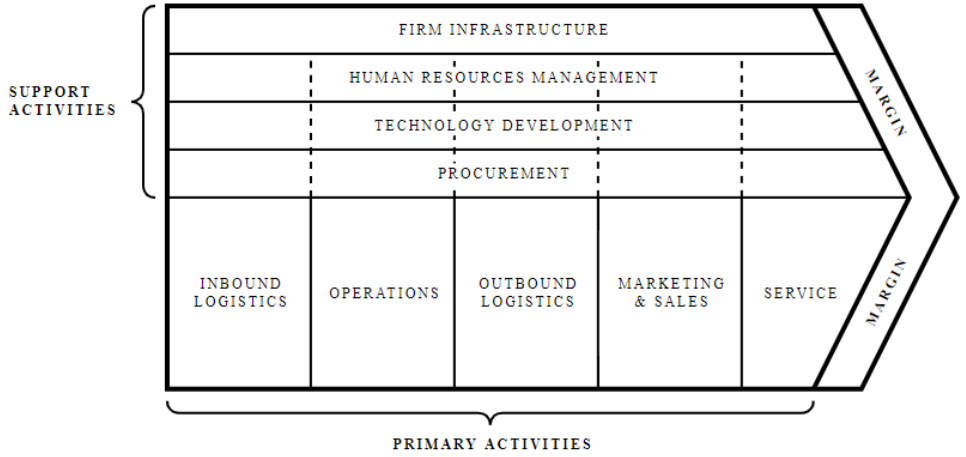


Izabela Skrzypczak, *Concrete production - an application of OC, January 2018, Web ofcurves in conformity control,* Conferences 49(1-2): DOI: 10.1051/e3sconf/20184900103

Managing Value

- Mentioned in relation to quality by David Garvin (value-based view of quality, c.1984).
- Michael Porter brought it to the fore with his Value Chain (c.1985).
- The growth of interest in Lean (itself based on Deming & PDSA) has catapulted the identification, tracking and management of value to the very forefront of process improvement.
- Now concepts of Value Stream and Value Chain co-exist alongside the supply chain.

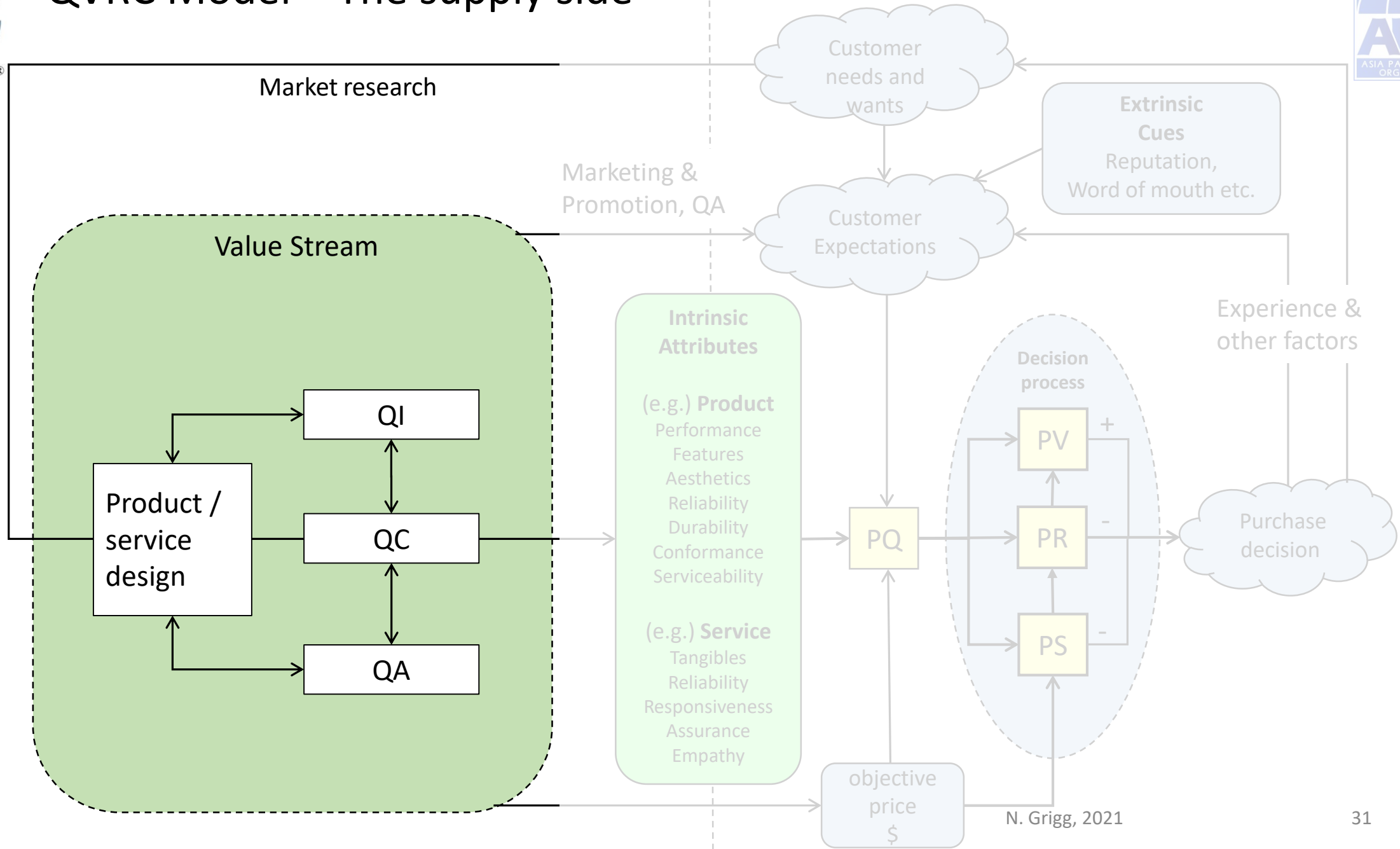
Porter's Value Chain



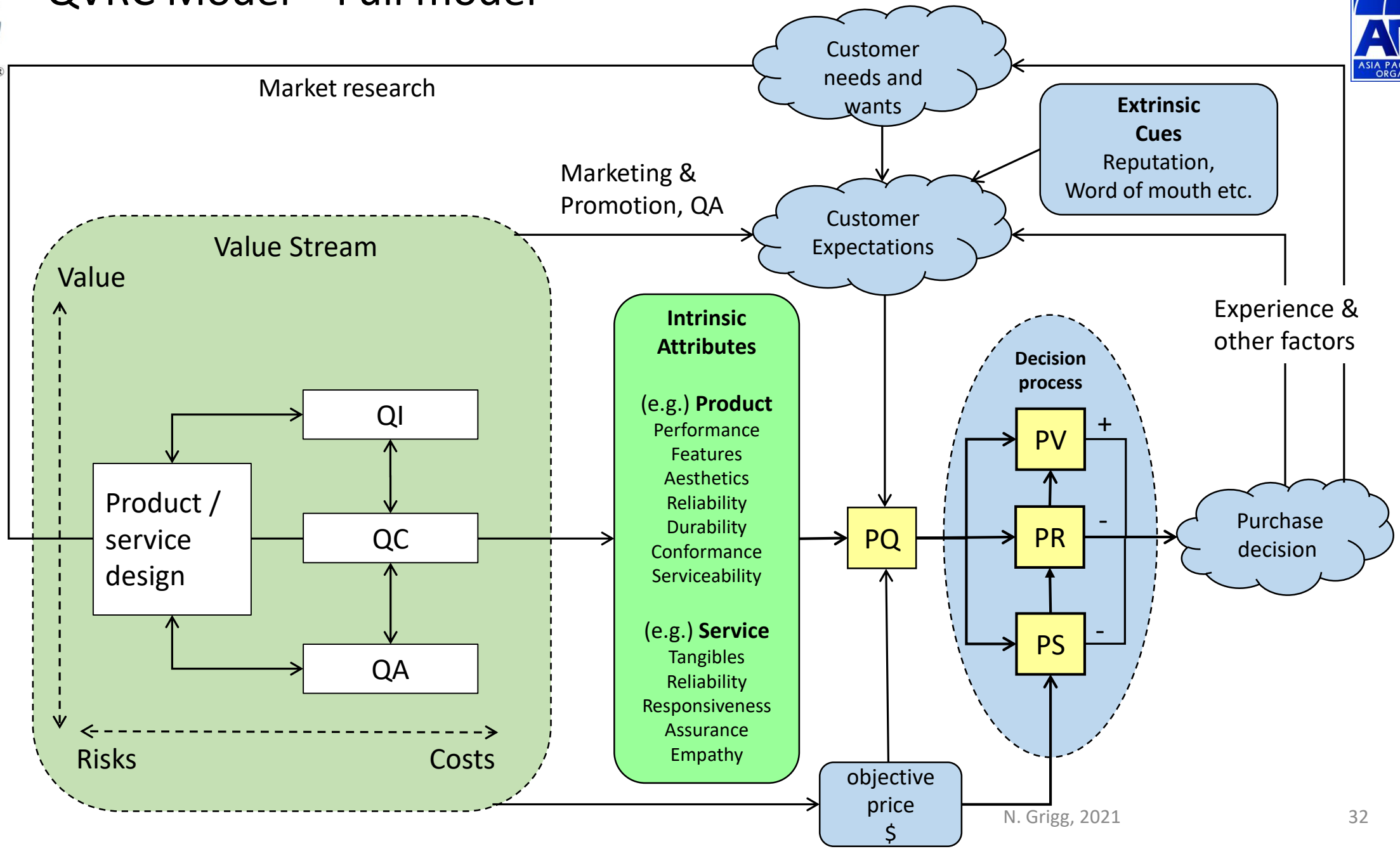
V, R and C can be actively managed throughout the value stream

- Design function creates the product or service required (the value), and the system to provide it;
- Quality Control reduces unwanted variation in the system, reduces risks and costs and keeps it from becoming chaotic;
- Quality Assurance system wraps a system around QC, and provides necessary confidence to value stream partners and customers (lowers perceived risk);
- Continual Improvement aims to increase value flow and further reduce waste (sources of risk and cost);
- Methodologies and tools can be categorised in relation to each element.

QVRC Model – The supply side



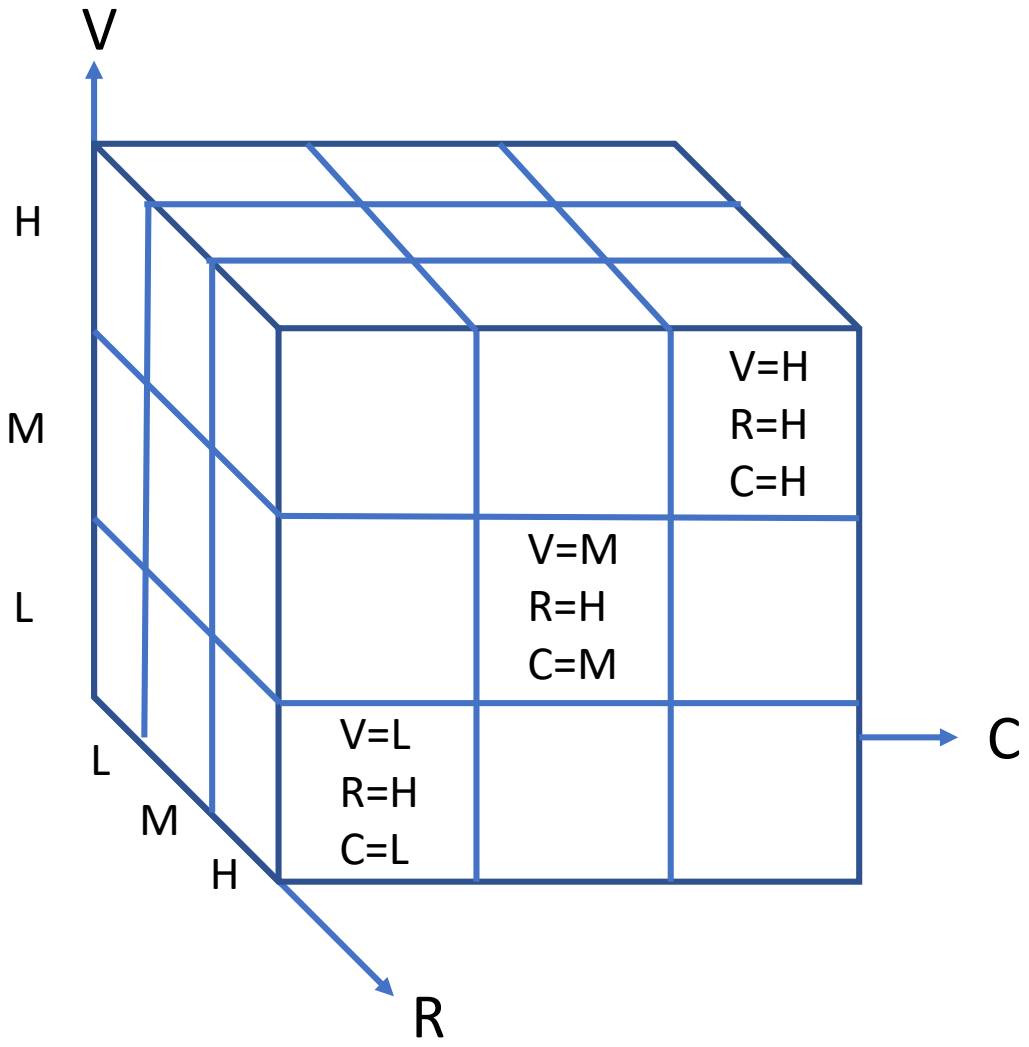
QVRC Model – Full model



Visualising three dimensions

Option 1
‘The Rubics Cube’

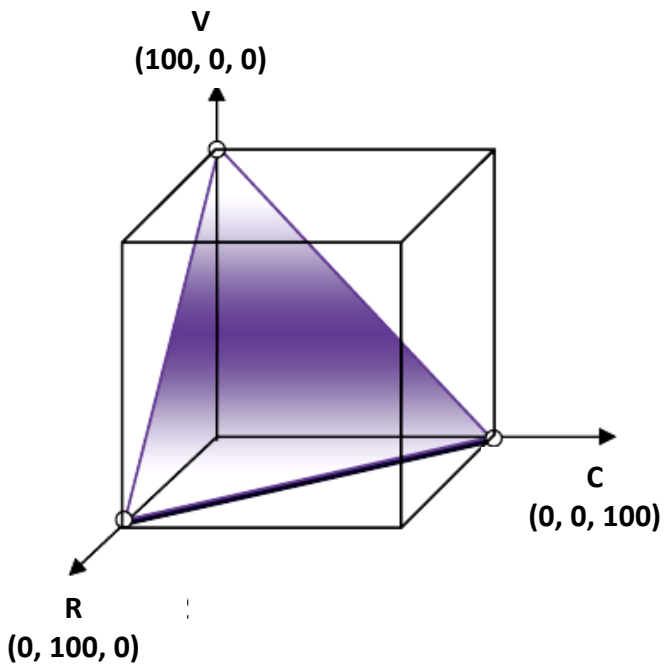
This is OK, but is very hard to render in 2D

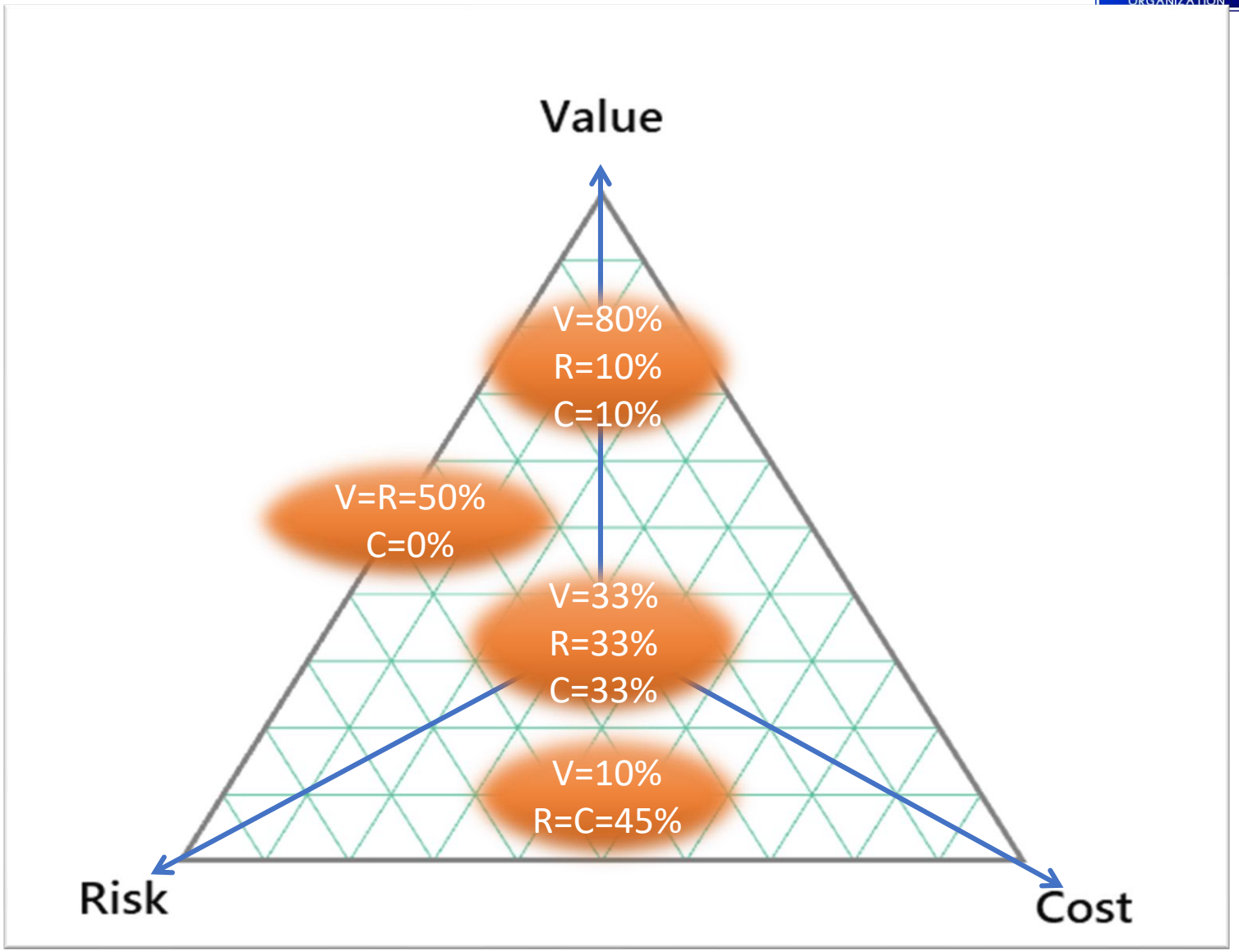


Representing the three dimensions

Option 2
The Triangle Plot

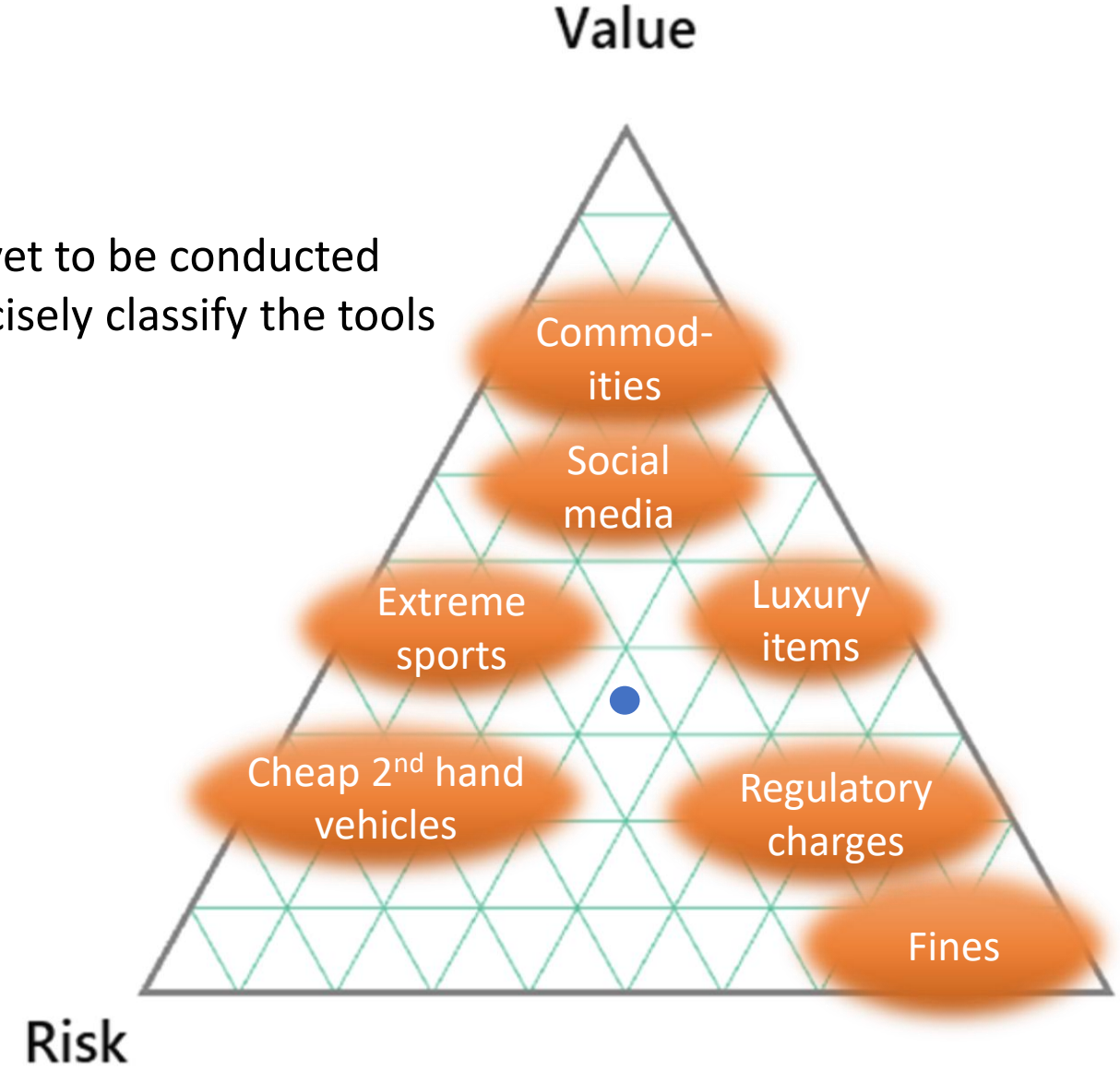
(proportional
V + R + C = 100%)





Classification of products and services

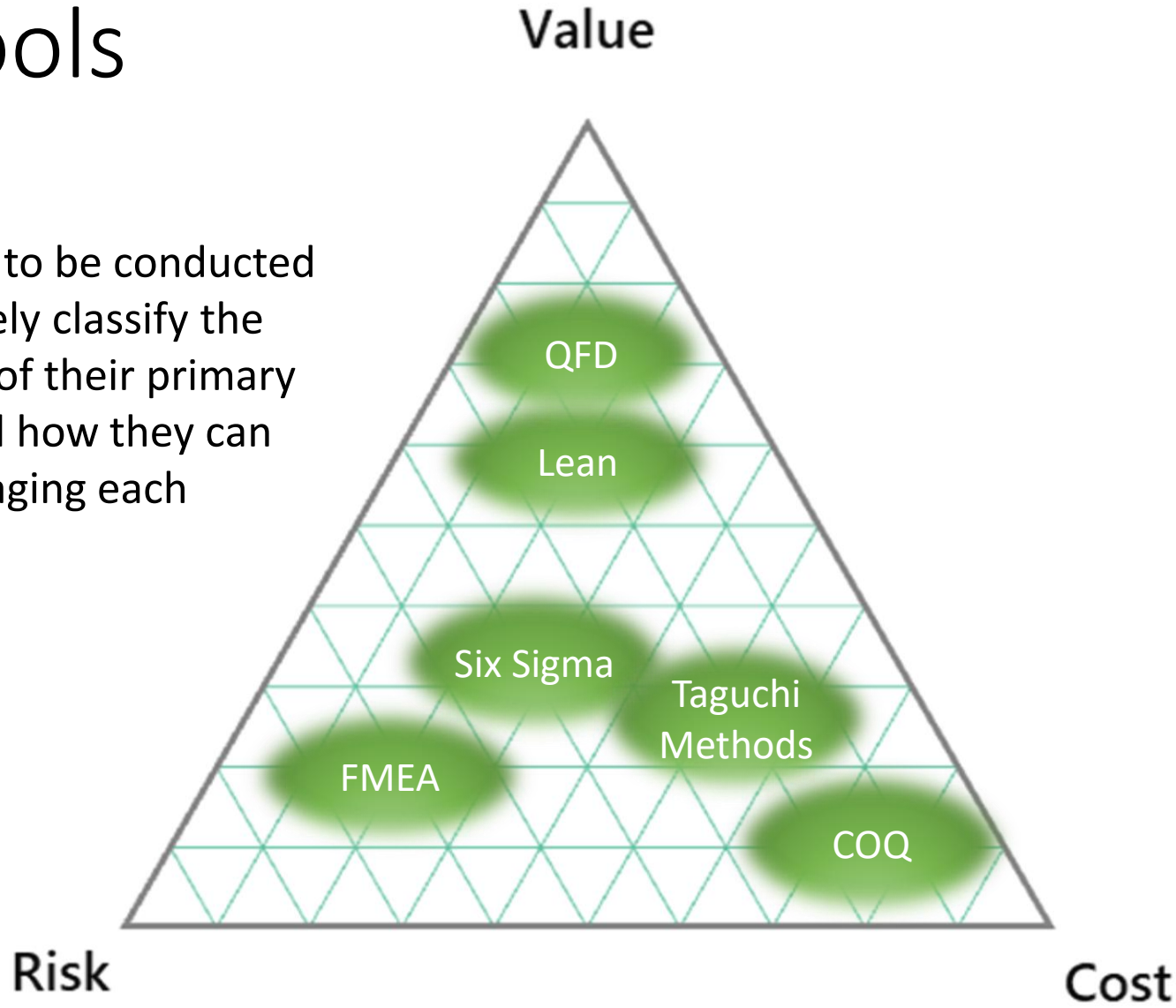
Research is yet to be conducted to more precisely classify the tools



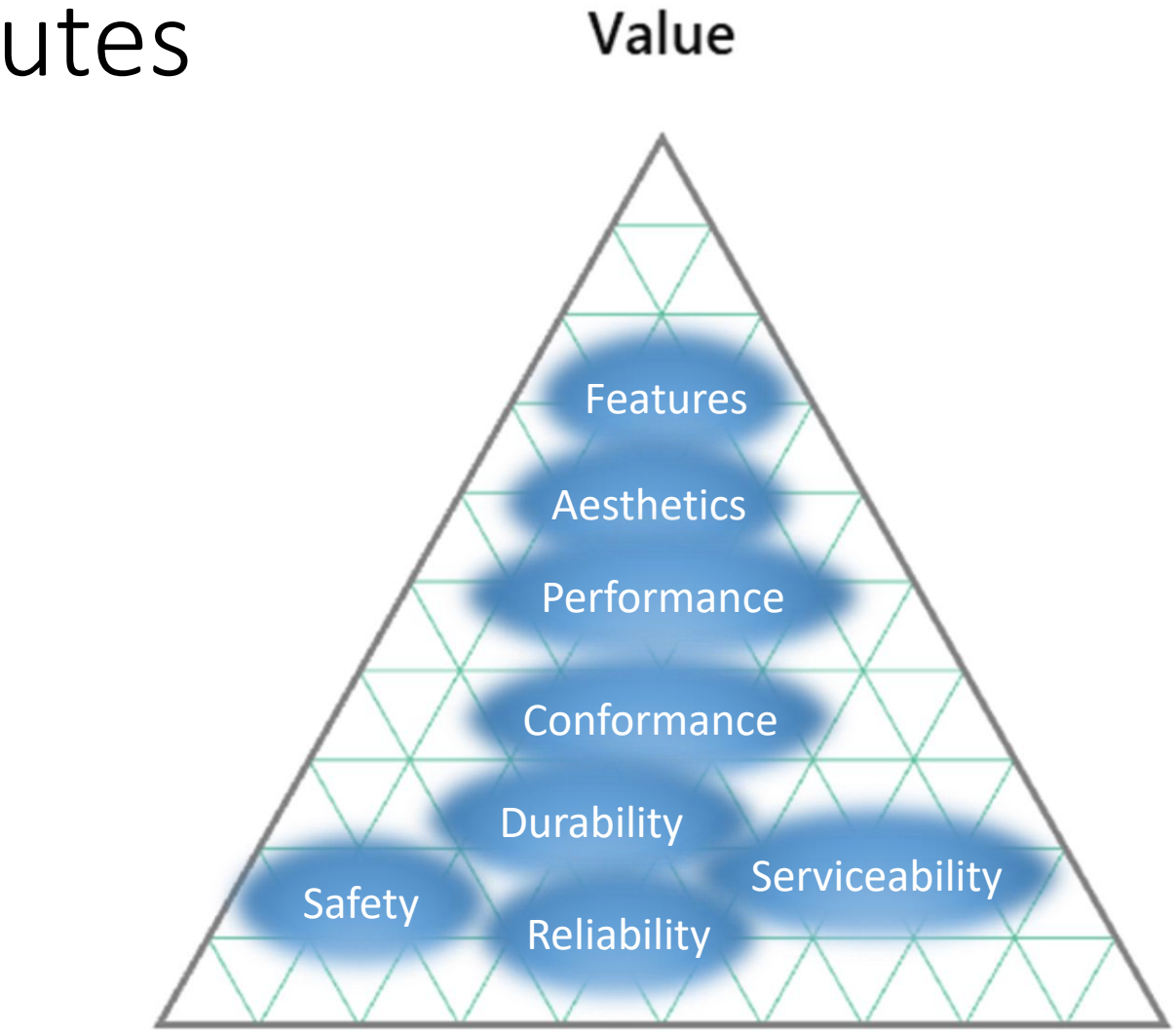
N. Grigg, 2021

Classification of quality methodologies and tools

Research is yet to be conducted to more precisely classify the tools, in terms of their primary orientation and how they can help with managing each aspect.



Classification of product/ service quality attributes



N. Grigg, 2021

Next stages

- A series of questionnaires to assess the V, R and C positions of ...
  - Various products & services to establish their respective profiles;
  - The various management methodologies and tools to assess their primary orientation.
- Focused research projects focusing on specific product and service categories (agribusiness, manufacturing, tourism etc.).
- Currently a PhD on Cashmere quality is nearing completion.

What is the value of this model?

- Knowing the expected V, R and C balance for the product or service in the market, enables the system to be designed to deliver the correct balance;
- Tools can be employed that match the required V, R and C balance;
  - QFD helps deliver value, FMEA helps manage risk, SS reduces variability, Lean emphasises value flow, COQ focuses on cost, and so on.
- Most products and services (and their processes) can be categorised under this scheme;
- Regardless of technological changes, these core elements of quality remain the same, and so...
- The future of Quality is now.

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