Stage Gates or Funnels?
Innovation Management and
Medical Textile Product Development

Dr. Martin W. King
Wilson College of Textiles, North Carolina State University

EXPO

1

Agenda

- Introduction
- New Product Development (NPD) and Innovation Strategy
- Cooper's Stage Gate Process
- Other Strategies
- How to Execute a Stage Gate Process

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

EXPO
2

2

Introduction

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

EXPO
3

3

Areas of Expertise for Medical Textile New Product Development

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

Ratner, B. D. (2004). *Biomaterials science: An introduction to materials in medicine*. Amsterdam: Elsevier Academic Press.

4

Impact Areas

Game Changing Technology Implementation
3D Printed Residential Buildings, SMART Technologies & Printed Electronics, Nanotechnology & Composites, Smart Ports

Sustainability
Circular Economy & Eco Design, Chemical Recycling & Waste-to-Energy, Water Purification, Biobased Materials, Solar Energy

Total Cost of Ownership Reduction
Single-Layer, Durable Anti-Corrosion Coatings, Mobile Drug Delivery Devices, Glass & Metal Replacement

Business Transformation
Commodity-to-specialty, Redesign and Diversification, Large Capital Management, Lean Project Management

Multi-Stakeholder Management
Value Chain Collaboration Creating, Facilitating and Managing Strategic Partnerships

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

5

New Product Development and Innovation Strategy

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

6

2

Strategic Growth Options for a Company - Ansoff's Matrix

	New Product	NPD-New Product Development	Diversification / NBD - New Business Development
New Product Development Stage Gate Process	New Product	Medium-high risk & Medium-High reward e.g. Barbed, knotless PLGA suture for orthopedic surgery @ current hospitals customers in USA	High risk & Medium-High reward e.g. Barbed, knotless PLA-co-TMC suture for trauma surgery @ US military on global scale
Other Stage Gate Processes	Existing Product	Market penetration ("expand/grow the core") Low risk & Low reward e.g. Resorbable PLGA suture for orthopedic surgery @ many hospitals across USA	New Market Development Medium - High risk & Medium - High reward e.g. Resorbable PLGA suture for trauma surgery @ US military on global scale
	Ansoff's Strategic Growth Options	Existing Market	New Market

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

EXPO

7

Innovation Management: 3 Horizons Model
Short-Medium-Long Term

- S / H1: Sustaining
- M / H2: Disrupting
- L / H3: Transforming

- How much effort/resources are spent on each horizon is company and industry specific
  - E.g. hairstyle products vs. cars vs. medical devices

- BUT: Successful companies disrupt themselves

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

EXPO

8

Stage Gate Process or New Product Development Funnel

Robert Cooper – Winning at New Products

Cooper: 5-6 stages + 6 Gates in the NPD Funnel

- Fuzzy Front End: Ideation / Discovery
1. Scoping
2. Business Case Building / Feasibility
3. Development
4. Testing & Validation
5. Commercialization / Launch
➢ Post Launch Monitoring

Many other ways to design your stage gate process, BUT all have key elements in common

Figure 2.4: A Strong Customer Focus Means Key Actions from Beginning to End in the Innovation Process

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development| Oct. 3, 2019

EXPO

9

Failure and Success in New Product Development (Cooper)

TABLE 2.1: SEVEN REASONS WHY NEW PRODUCTS FAIL

1. Me too or tired new products—the product is wrong! It fails to excite the customer—there is no "wow factor" and no compelling value proposition for the customer
2. Weak front-end homework—the necessary due diligence (the market study, the technical assessment, the financial analysis) is superficially done or not done at all.
3. A lack of customer or user input and market insights—what the product should be and is defined with little input from the marketplace. When the product goes to field trials or launch, it's not quite right (or dead wrong)!
4. Unstable product specs and project scope creep—the product and project definition keep changing as the project moves along, the number one cause of delays later in the project.
5. Dysfunctional project teams, too many functional silos—members from all the key functions are missing; the team leader is the wrong person; the team does not share a common vision; team members lack commitment; and team accountability is missing.
6. Far too many projects in the pipeline (no focus)—too many projects are approved, resulting in underresourced projects and people spread far too thin. Projects take too long, corners are cut, and project quality declines.
7. A lack of competencies, skills, and knowledge—people with the right skills, competencies, and knowledge to undertake the project are not available. The project, as defined, never should have been approved in the first place.

TABLE 2.2: WHY NEW PRODUCTS SUCCEED—EIGHT CRITICAL SUCCESS DRIVERS

1. A unique superior product—a differentiated product that delivers unique benefits and a compelling value proposition to the customer or user—is the number one driver of new product profitability.
2. Building in the voice of the customer—a market-driven and customer-focused new-product process—is critical to success.
3. Doing the homework and front end loading the project makes the difference between winning and losing. Due diligence done before product development gets underway pays off!
4. Getting sharp and early product and project definition—and avoiding scope creep and unstable specs—means higher success rates and faster to market.
5. Spiral development—build, test, get customer feedback, and revise—putting something in front of the customer early and cheaply, and often gets the product right.
6. The world product—a global product or "glocal" product (global concept, locally tailored) targeted at international markets—is far more profitable.
7. A well-conceived, properly executed launch is central to new-product success. And a solid marketing plan is at the heart of the launch.
8. Speed counts! There are many good ways to accelerate development projects, but not at the expense of quality of execution.

Source: R.G. Cooper, PDMA Handbook, endnote 1.

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019
EXPO

10

Failures in New Product Development (Cooper)
Weak Front-end Homework

- "Front-End Loading" will benefit the project throughout its lifetime

2. Weak Front-End Homework

Some businesses simply fail to do the needed upfront or front-end work on projects. The necessary due diligence—the market study, the technical assessment, the financial analysis—is superficially done or not done at all. Figure 2.1 reveals the facts: Witness the high percentages of firms that do a poor job on key front-end tasks (note that results for average firms are shown, as well as results for the 20 percent worst-performing businesses). Among worst performers:

- 96 percent do a poor job on assessing the value of the product to the customer;
- 93 percent do the market research and voice-of-customer (VoC) work poorly or not at all;
- 77 percent carry out the technical assessment deficiently; and
- 77 percent don't do the business and financial analysis on the project well.

These are the 20 percent worst firms, so what about the typical firm? The data for average firms in Figure 2.1 are almost as damning, with more than half executing poorly across all six front-end tasks. These are frightening results, and they reveal a *quality crisis in the innovation process*—no, not product quality—but a crisis in "quality of execution." Simply stated, key tasks are not done, or not done well, which leads to too many underperforming new products.

The result of poor front-end homework is that when it comes time to make key decisions—product design or Go/Kill investment decisions—there are many assumptions, but *few hard facts*. Frequently this lack of front-end work is due to no time and no money to do the work, and very often because people are too busy on other tasks. Both are lame excuses.

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019
EXPO

11

Stage Gate Process
Key goals

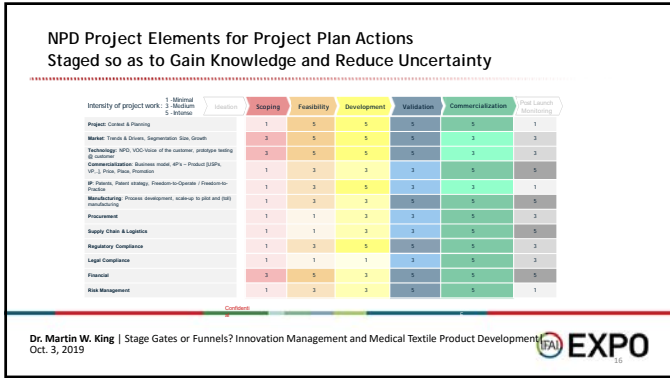- Doing the right projects + Doing projects right

- Answer 4 questions:
  I. What is it?
  II. Does anyone care? ⇒ Customer feedback!
  III. Can we do it? ⇒ Product iterations,........
  IV. Can we make money?

- During each stage:
  - Increase accuracy of assessments/data
  - Reduce uncertainty & risks

- IF you fail, fail early!

Figure 2.4: A Strong Customer Focus Means Key Actions from Beginning to End in the Innovation Process
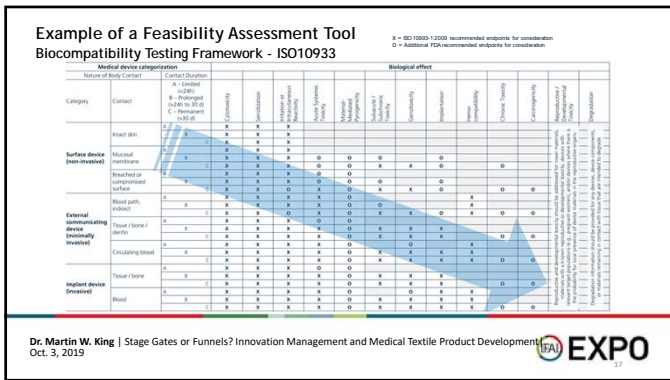
I. What is it?   III. Can we do it?
II. Does anyone care?
IV. Can we make money?

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019
EXPO

12

Slide 13

Cooper's Stage Gates are ONE Approach
You Can Use a Different Number of Steps in the Process

- Many variations: specific to company (culture), industry branch
- No holy grail, BUT don't overcomplicate OR simplify, BECAUSE all checks on the vital elements should be there during STAGES and during GATES

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

13

Slide 14

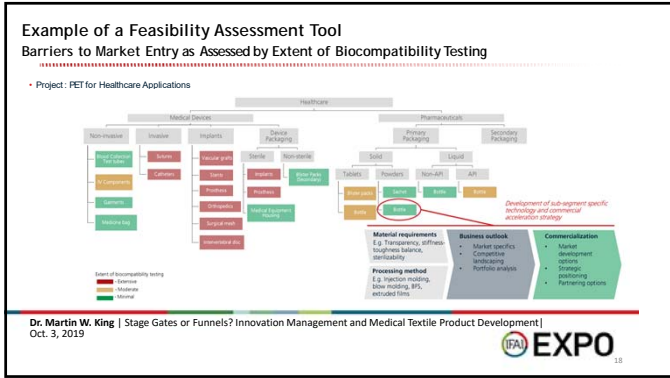**Stage vs. Gate**

Stage

The Work you perform in order to:
- Gain knowledge (K-U-A)
  - More knowns [K], less unknowns [U]
  - Assumptions [A] become knowns
  - Unknowns become assumptions
- Reduce uncertainty
- Reduce risk / Improve Risk management

Gate #

A filter to judge if it is worth to invest more time and money/resources and go to the next phase of the NPD funnel, because this potential new product seems to have a good ROI (return on investment)
- Team needs to do homework & stakeholder management, then present case to gate keeper(s)/manager(s) for gate decision
- Keep it objective
  - No pet-projects or ever-greens
  - Fair inter-project comparison through templates/consistency
  - Gate keepers are the decision makers, not project leaders
- Not overly dependent on financials in early stages
- Proper risk management by team & appreciation for uncertainty by gate keepers
- Make a clear gate decision
  - Go (funding & project plan approved)
  - Kill (and do proper post-mortem analysis and learning & archiving)
  - Re-Do (part of) last stage then retry for GO (due to bad homework t.b. avoided)
  - Hold/Shelve (if viable project BUT limited resources or other priorities)
- Make it a routine exercise for the entire company/BU

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

14

Slide 15

Porter's Value Chain in a Company and New Product Development (NPD)

- Goal of Stage Gate process for NPD:
  - Have all elements in place, on spec, on time by the time you launch a new product

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

15

NPD Project Elements for Project Plan Actions
Staged so as to Gain Knowledge and Reduce Uncertainty

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

16

Example of a Feasibility Assessment Tool
Biocompatibility Testing Framework - ISO10933

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

17

Example of a Feasibility Assessment Tool
Barriers to Market Entry as Assessed by Extent of Biocompatibility Testing

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development|
Oct. 3, 2019

18

Innovation Management: How to Launch MORE New Products?
Shape of the NPD funnel: Idea Input & Funnel Efficiency

- Medium Input X Low Efficiency
- Higher Input X Low Efficiency
- Medium Input X Higher Efficiency
- Higher Input X Higher Early Stage Efficiency (i.e. Ideation & Scoping)

- Starting situation: NOT enough new products, lagging in innovation
- i.e. Most companies

- *More* ideas lead to more new products
- Easier but more inefficient (straining organization/resources)

- *Better* ideas lead to more new products
- Less straining on organization/resources
- BUT requires more state gate discipline & excellent idea input

- *More* ideas and *better* project selection lead to more new products
- Less straining on organization/resources
- BUT requires excellent state gate discipline & execution

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

IFAI EXPO
19

19

Innovation Management: Project Portfolio Management

- Balance total number of projects in funnel with available resources
- Keep a healthy funnel: enough projects in each stage to serve short, medium and long term innovation goals

Ideation — 1 Scoping — 2 Feasibility — 3 Development — 4 Validation — 5 Commercialization — 6 Realization — 7

10-100's | 5-30 | 3-10 | 3-5 | 1-3 | 1-2 | 1-2 per cycle

THEN
Product Portfolio Rationalization
&
PLC-Product Life Cycle considerations

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

IFAI EXPO
20

20

Trends in Innovation and New Product Development

- Avoid "not invented here" syndrome: Open innovation

Open innovation

Other firm's market
Licence, spin out, divest
Our new market
Internal technology base
Internal/external venture handling
Our current market
External technology insourcing
External technology base

- Crowd sourcing
- To manage cost & risk: Corporate Venturing/CVC instead of M&A

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

IFAI EXPO
21

Source: H. Chesbrough

21

Best Corporate and Industrial Practices
Key Items in Your Stage Gate New Product Development Process

- Stage gate process hygiene
  - Proper Project management
    - Iron triangle:
      - Scope - Watch out for scope creep!
      - Quality -What is acceptable (detail/accuracy/uncertainty of) information to make an informed decision?
      - Time - Watch out for time creep!
      - Budget – Watch out for overspending!
    - Project Charter – Align all stakeholders, clear deliverables
    - Planning (Gantt, Known, Unknown, Assumptions)
    - Align all stakeholders, clear deliverables & task distribution
  - Properly defined roles & responsibilities
    - R– Responsible (for execution of task)
    - A – Accountable (for delivery of task)
    - C – Consulted (on topic/decision)
    - I – Informed of decision
    - S– Support (on task, execution of subtasks if required)
- Financials:
  - Quantify ROI by NPV (net present value) calculations
    - IF + invest, IF– do not invest
    - Compare NPVs of various projects: highest + value wins
    - Helps upper management judge the benefits of doing your project
    - BUT, do not use too soon in NPD funnel

Project Scope

Quality/Detail

Time   Resources

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

EXPO

22

Best Corporate and Industrial Practices
Use Features-Advantages-Benefits-Value (FAB$) Methodology

- Quantify customer value, define R&D targets & do product development iterations
- Do not add extra features (cost for you) that do not add value (for the customer)
- Ultimately helps with articulating the Value Proposition for marketing & sales of commercial product

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

EXPO

23

Best Corporate and Industrial Practices

Business Model Canvas by Alex Osterwalder - http://alexosterwalder.com/

- A clear way to articulate HOW you will build your new product or even your new business/company

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

EXPO

24

Best corporate and Industrial practices
Managing Uncertainty in an New Product Development Funnel

- Managing uncertainty
  - Margin of error: Make a Worst-Best-Realistic scenario approach to e.g. product revenue forecasts

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

25

Best Corporate and Industrial Practices
Managing Risk in an New Product Development Funnel

- Risk Management
  - Qualitative Risk
  - Quantified Risk: Probability x Effect
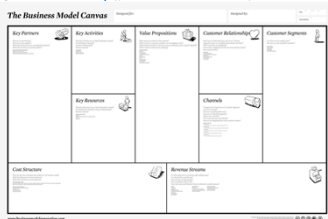 - Have mitigation and contingency plans

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019
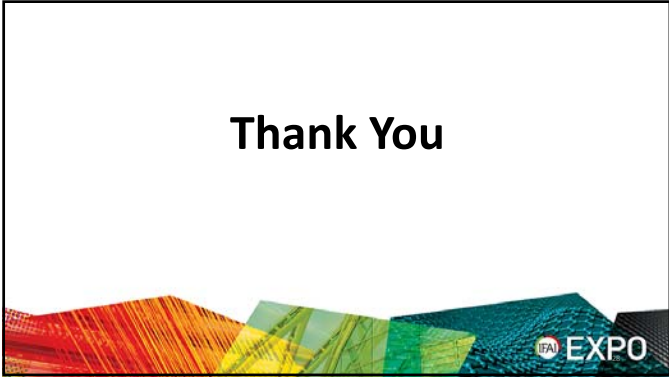
26

Best Corporate and Industrial Practices
Keys to Success for Stage Gate Process

1. Doing the right projects + Doing projects right
2. Do your homework: "front-end loading", use good templates & tools (best practices)
3. Increase accuracy & decrease uncertainty/risks during each stage on: 4 main questions + all key elements
4. Assure sufficient & early market/customer feedback loops & product development iterations
   ➢ Do not underestimate how long this takes
5. IF you fail, fail early!
6. Balanced funnel composition: enough projects in each stage to serve short, medium and long term innovation goals
7. Balanced resource demand: Balance total number of projects in funnel with resources
8. Be strict and objective with stage gate hygiene (pass/fail criteria), and realistic in assessments and assumptions (front-end homework)

Dr. Martin W. King | Stage Gates or Funnels? Innovation Management and Medical Textile Product Development
Oct. 3, 2019

27

Thank You

IFAI EXPO

28