Agile–Stage Gate Management (ASGM)

NPD Implementation practices from global firms developing complex, physical products

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Researcher

- University of Michigan: BSME (93); Purdue University: MSE (02)

- Michigan Tech: PhD (Expected - Dec 2018)

- Ford Motor – Powertrain – Mfg Eng, Product Design, Eng Mgt: 93 - 07

- Stryker Corp – Medical Devices – QA, NPD, M&A, Leadership: 07 – Pres

  - *Current Role: Design Control, Division Process Owner*
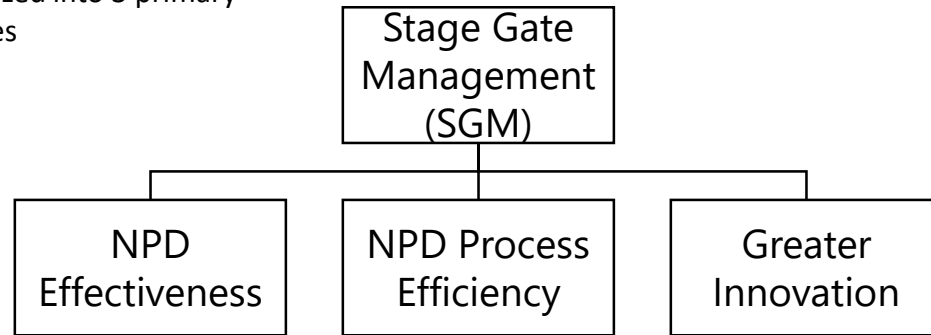
SGM Background

- Stage Gate Management (SGM) well known process framework for NPD with documented successes
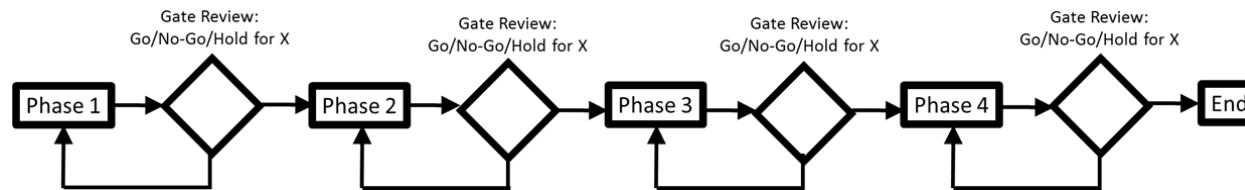
- Development divided into defined chunks, review status/progress at defined intervals

- New products can drive a firm's growth and viability, process tools are important

- Big $$$ in play - Global R&D spend approx. $1T (2010); U.S. spent $499B (2015)

- Executing NPD faster establishes a first mover advantage

- SGM hallmarks are structure, rigor, and process detail, but also criticisms

SGM Literature Review

Literature review of SGM related articles (1991-2016) organized into 3 primary themes


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                    Stage Gate
                    Management
                       (SGM)
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    NPD              NPD Process      Greater
    Effectiveness    Efficiency       Innovation
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NPD Effectiveness	NPD Process Efficiency	Greater Innovation
Produce intended/expected results of the NPD effort, high quality performance from intended customers and market success	Move though development process with minimal rework, scope changes, and least possible consumption of resources	Means for organizations to think more broadly about product success
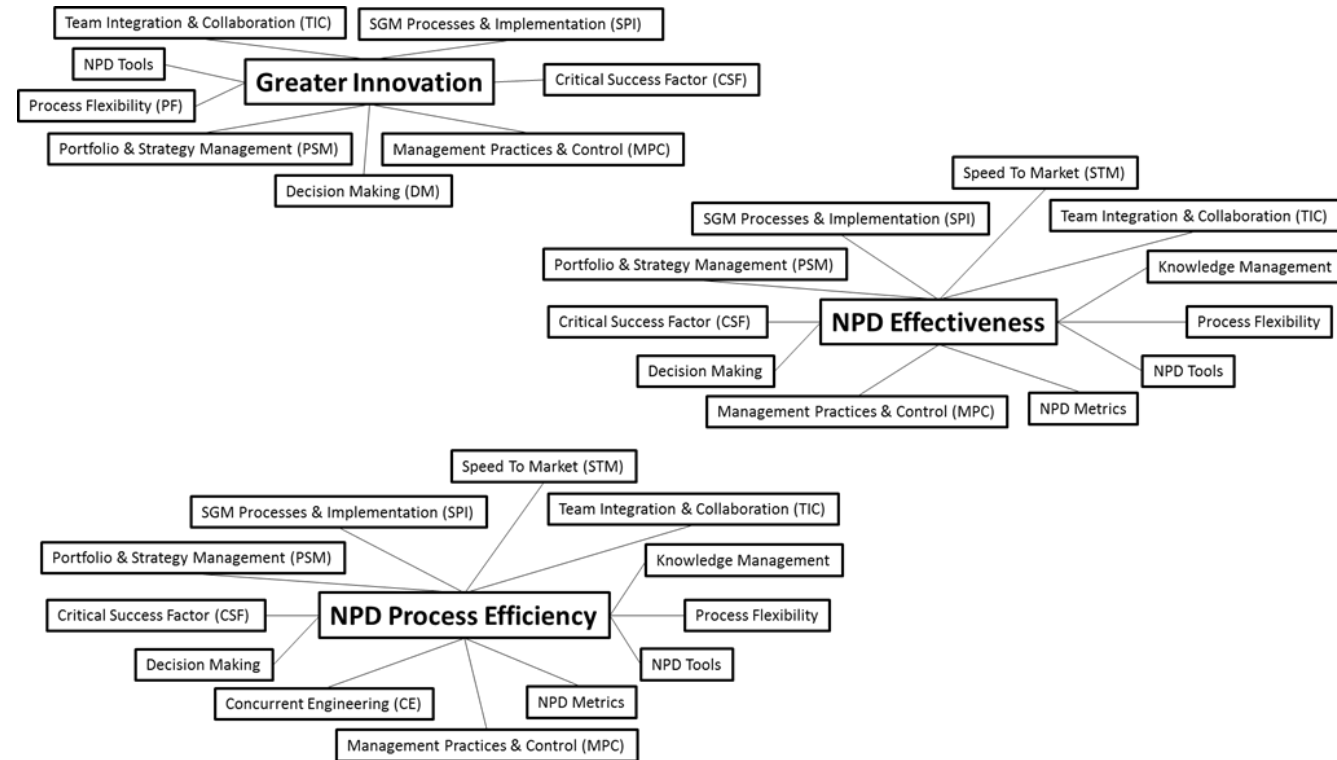
SGM Criticisms

- Does NOT fit non-traditional projects/NOT all project types

- NOT scalable to ensure 'right' flexibility

- NOT fluid enough for late spec freeze

- Drives MORE resource utilization, takes LONGER

- **Agile** - designed for flexibility, continuous learning, and customer alignment

  - Is this the answer??

    - Flexibility = Change quickly, accommodate more opportunities

    - Innovation = NPD away from the core, new customer/markets/technologies/systems

Research Goal

- Inductively develop theory from qualitative interview data on how firms manage NPD using ASGM for physical products

- Understand if ASGM techniques lead to shorter development cycle times, more market success, and greater levels of innovation

Study Structure

- **Firms** – NPD of physical products, using 'flexible' techniques

- **Interviews** – 30-60 mins, recorded, transcribed

- **Participants** – Experienced w/ASGM, different functional domains

- **Contacts** – LinkedIn; Professional Orgs; Agile user groups; Industry contacts

- **Multi Case Study Approach** - Each Business Unit (BU) a case study

- **Demographics** - Industry, geography, market position, R&D team size

- **Method** – Grounded theory approach, structured, scientifically recognized

Agile Background

- Smaller iterative loops (W Royce, 1970); Frozen designs don't accommodate changes (A Spector, 1986)

- Agile Software Development Manifesto – 'Lightweight' SW process (Agile Alliance, 2001) values:
    - Individuals and interactions over processes and tools; Working software over comprehensive documentation
    - Customer collaboration over contract negotiation; Responding to change over following a plan

- Next generation SGM, faster, more flexible, spiral development (R Cooper, 2014)

- ASGM - More flexibility for technology companies (A Sommer et al, 2015)

- ASGM – More flexibility for physical products (2 firms) (R Cooper, 2016)

- Need for a broader ASGM study for global developers of physical products

Qualitative Survey Focus Areas

- Importance of New Product Development (NPD)

- Challenges with current NPD process framework

- Updates to NPD framework to address concerns

- Benefits realized from NPD framework updates

- NPD framework "Do's and Don'ts" based on participant experience

- Insights into existing gate reviews in use today

- Customer role within the NPD process

Study Participants

- 32 Interviews, 4 Firms, 5 BU's

- Multiple levels of BU organization

- Example firm:

Corporate Location	Europe
Revenue	€20B
Growth	~3%
CAGR	~5%
Margins	~5%
ROCE	~25%
# Employees	~100,000
R&D Spend	~5%
BU Team Focus	NA Technology Discovery/Implementation

Characteristic		Interviews
Industry	Home & Office Products	12
	Transportation & Logistics	5
	Hardware	4
	Health Care Equipment & Supplies	8
	Automotive	3
Organizational Level	Leadership	3
	Individual Contributor	14
	Resource Manager	6
	Program Management	9
Geography	NA - US	15
	NA - Canada	4
	EU - Germany	8
	EU - Switzerland	5
Discipline	Technical	24
	Business	8

Interim Analysis

Theme – NPD Benefits

NPD Benefits

- Profitability, Growth
- Innovation
- Product Performance
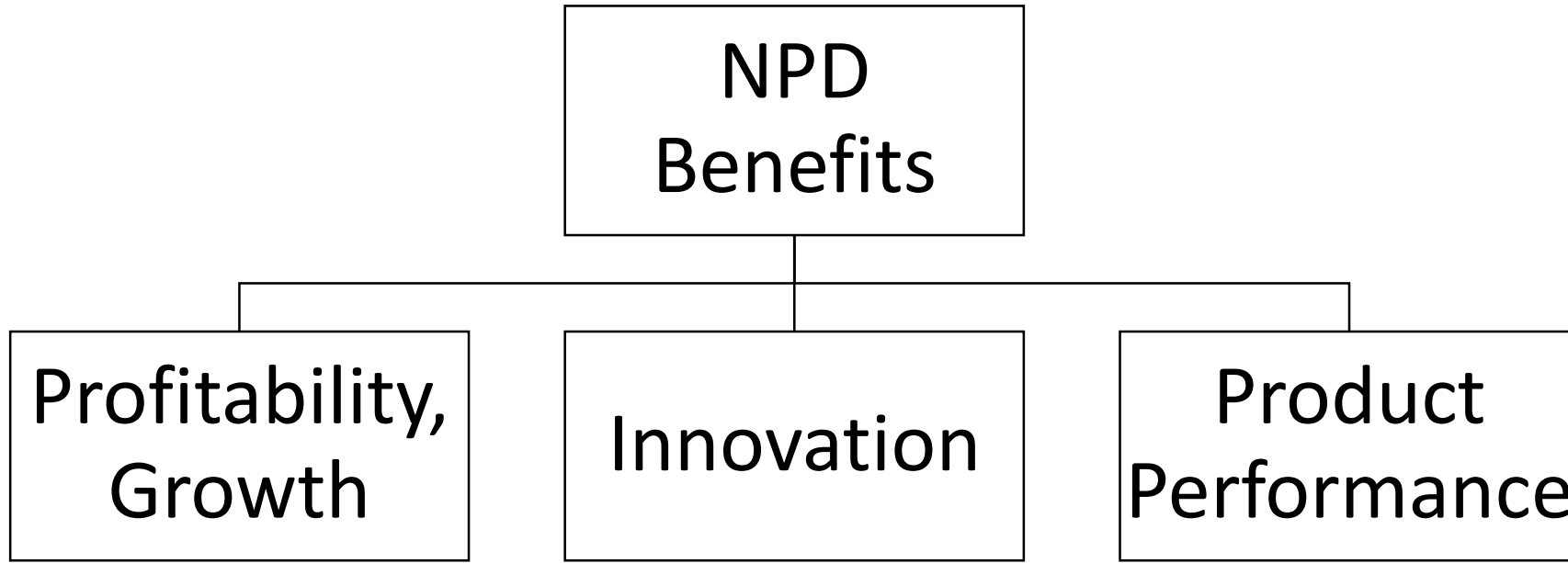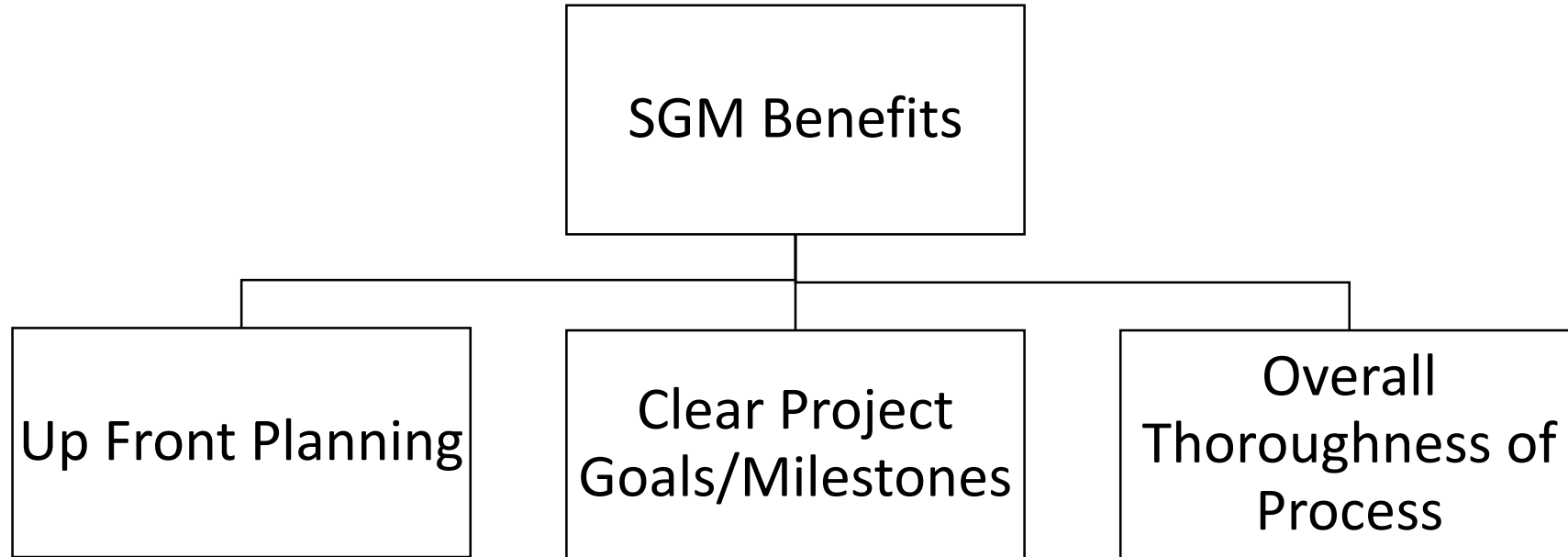
"…companies seek to stay competitive from the market ……solve their customers' problems in new ways"

"NPD allows us to put innovation into products and gain premium margins"

"…..establish good systems, good product, standardized systems….building a quality product."

Theme - SGM Benefits

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                    │    SGM Benefits     │
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                    └──────────┬──────────┘
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│                 │  │                   │  │      Overall      │
│ Up Front        │  │  Clear Project    │  │  Thoroughness of  │
│ Planning        │  │  Goals/Milestones │  │      Process      │
│                 │  │                   │  │                   │
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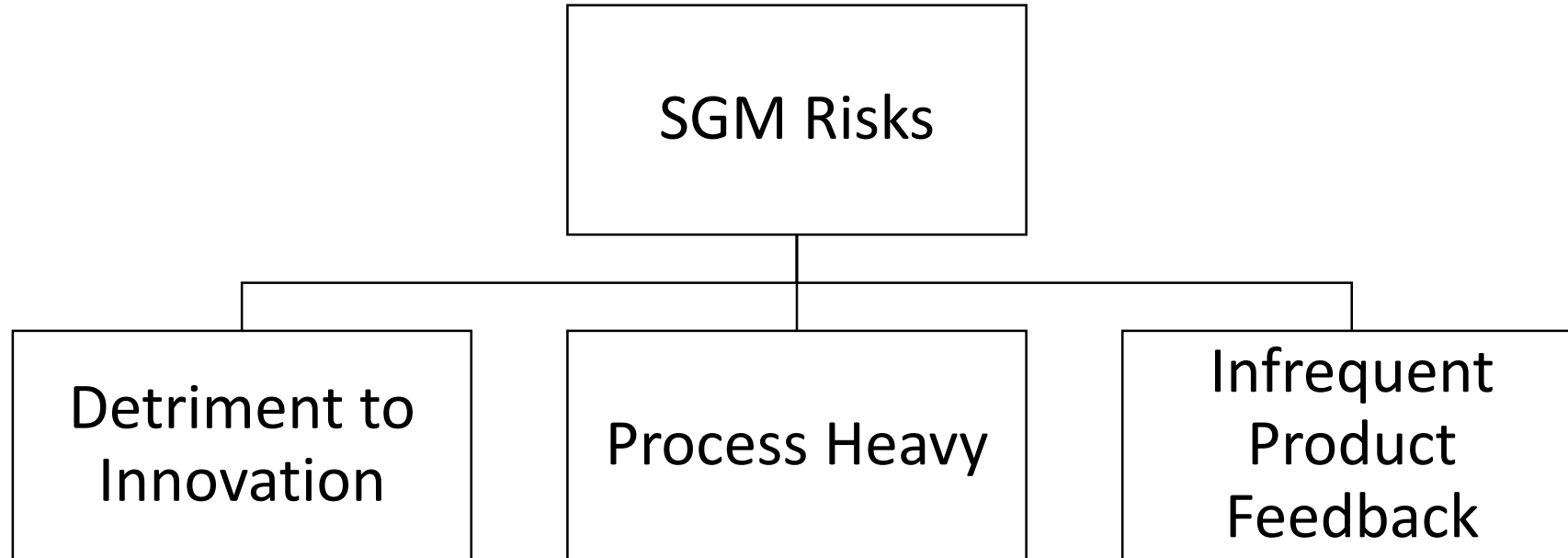*"…big-ticket…long-lead…difficult to modify…need definition up front."*

"…stuff with a lot of risk/lead time…[big] penalty…if wrong"

"….requires up front diligence…sure that you have got I's dotted and T's crossed… you're not missing anything…covered your bases."

"For ground up design, SGM's are good…make sure all the research is done, a good concept all the way through…make sure that nothing is forgotten."

Theme - SGM Risks


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                    │    SGM Risks    │
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   ┌────────┴───────┐ ┌──────┴──────┐ ┌────────┴────────┐
   │  Detriment to  │ │   Process   │ │   Infrequent    │
   │   Innovation   │ │    Heavy    │ │     Product     │
   │                │ │             │ │    Feedback     │
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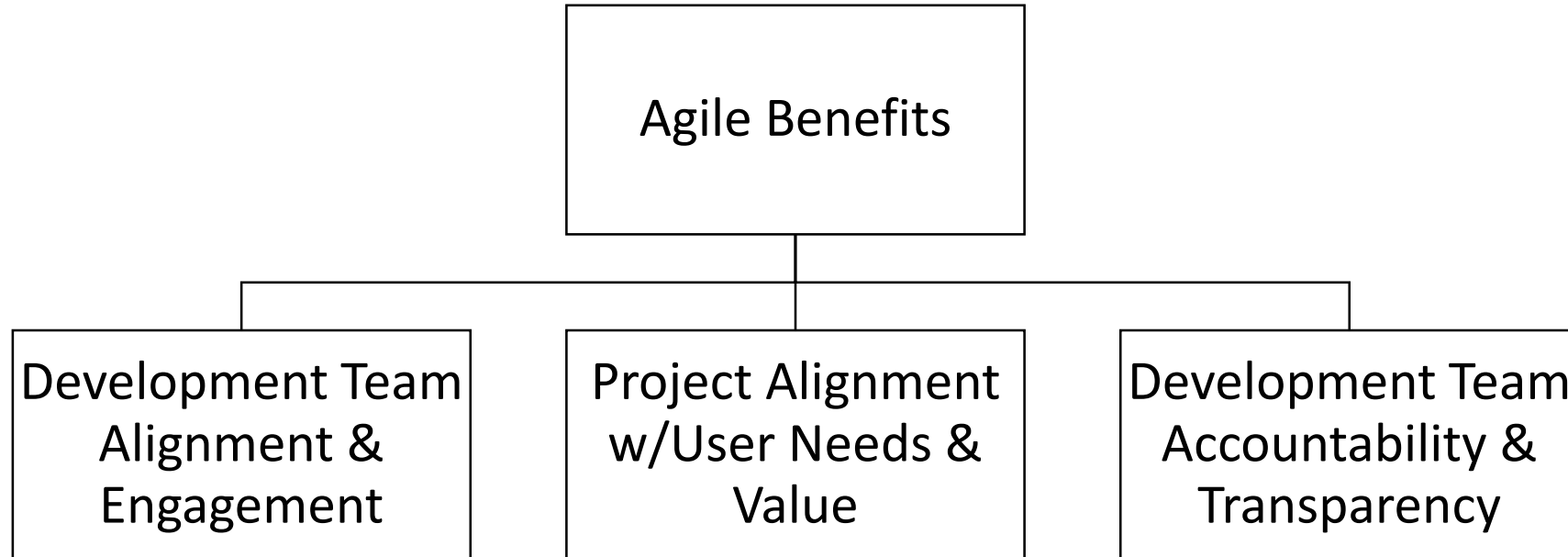
"….there's challenges in a stage of disruption….SGM process is not particularly nimble….good at…incremental innovation"

"..small incremental [projects] can be cumbersome to go through all the gates"

"….product that is to be developed, is bound to [early requirements]. Validation…when the first unit is launched"
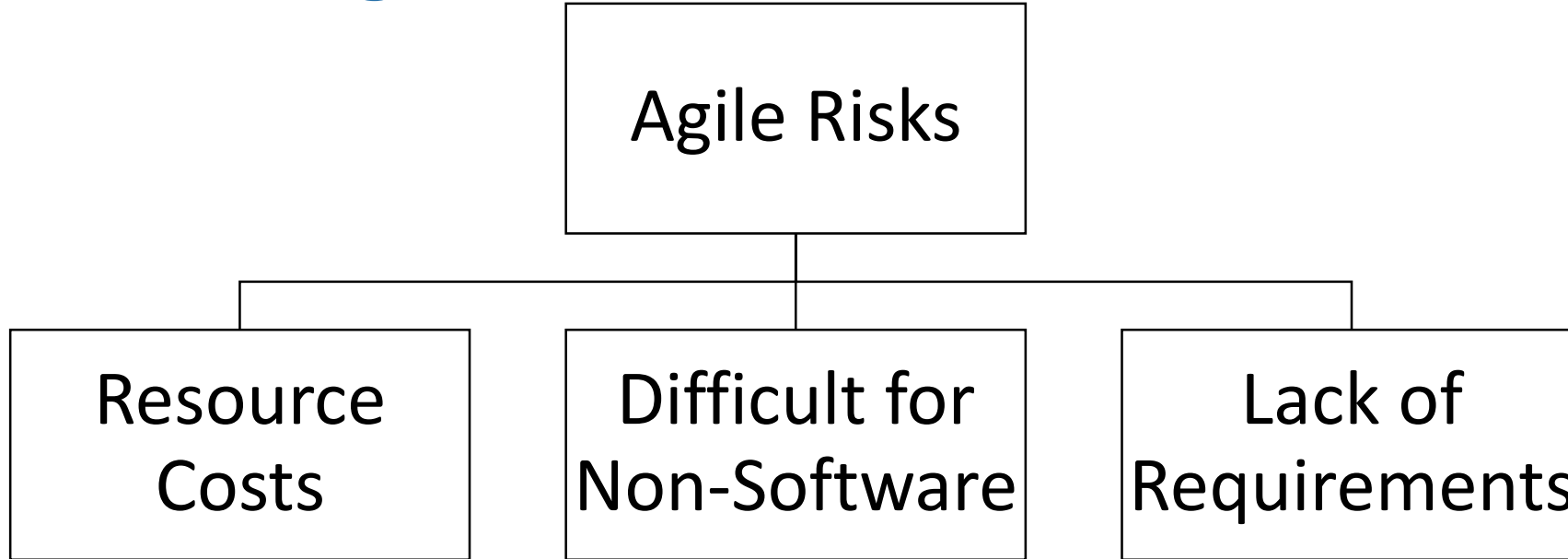
Theme - Agile Benefits

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                    │   Agile Benefits    │
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│ Development Team │   │ Project Alignment│   │ Development Team │
│  Alignment &     │   │  w/User Needs &  │   │ Accountability & │
│  Engagement      │   │     Value        │   │  Transparency    │
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"…everybody knew what was really going on…" "…not only stakeholders, but team members…feeling plugged in."

"…demos at end of each sprint…sure product owners…understand what was done…" "…faster idea of what the product was going to look like…"

"…SCRUM itself…makes people accountable…" "They have it up in the board…have to talk to it." "…everybody was accountable…."

Theme - Agile Risks


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                    ┌─────────────────┐
                    │   Agile Risks   │
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              ┌────────────┼────────────┐
    ┌─────────────┐ ┌─────────────┐ ┌─────────────┐
    │  Resource   │ │ Difficult   │ │   Lack of   │
    │   Costs     │ │   for       │ │Requirements │
    │             │ │Non-Software │ │             │
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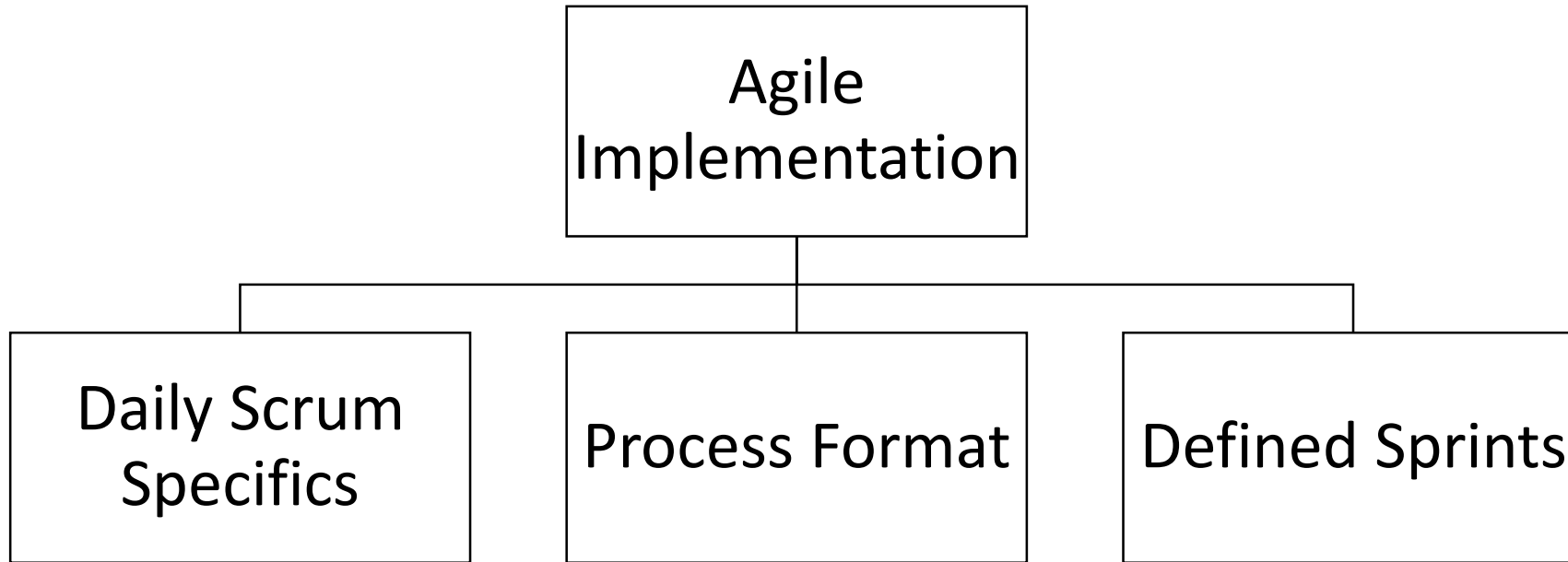*"...cost is...room full of people...."*

"...one of the downsides is...[team] is dedicated to the work...projects generally get more expensive."

"...big outsource component...can be difficult..." "...mechanical development.....never finish just a piece..."

"...if you just focus on the task at hand...you can lose the...big picture – and not stay so much focused on the schedule."

Theme – Agile Implementation

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                  ┌─────────────────────┐
                  │       Agile         │
                  │  Implementation     │
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  ┌──────────────┐   ┌──────────────┐   ┌──────────────┐
  │ Daily Scrum  │   │   Process    │   │   Defined    │
  │  Specifics   │   │   Format     │   │   Sprints    │
  └──────────────┘   └──────────────┘   └──────────────┘
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"…everyday…a 20-minute Scrum…"

"…had three-week Sprints and daily Scrums." "We had 15- to 30-min Scrums…"

"…trying to use it…exactly [as] it's defined by framework" "…have the product owners and scrum master…"

"…we scrum ceremonies…"

"…build out backlogs…Sprint planning…"

"…points for each Sprint…things get accepted [and] rejected…" "… figure out what needs to carry over…."

Insights
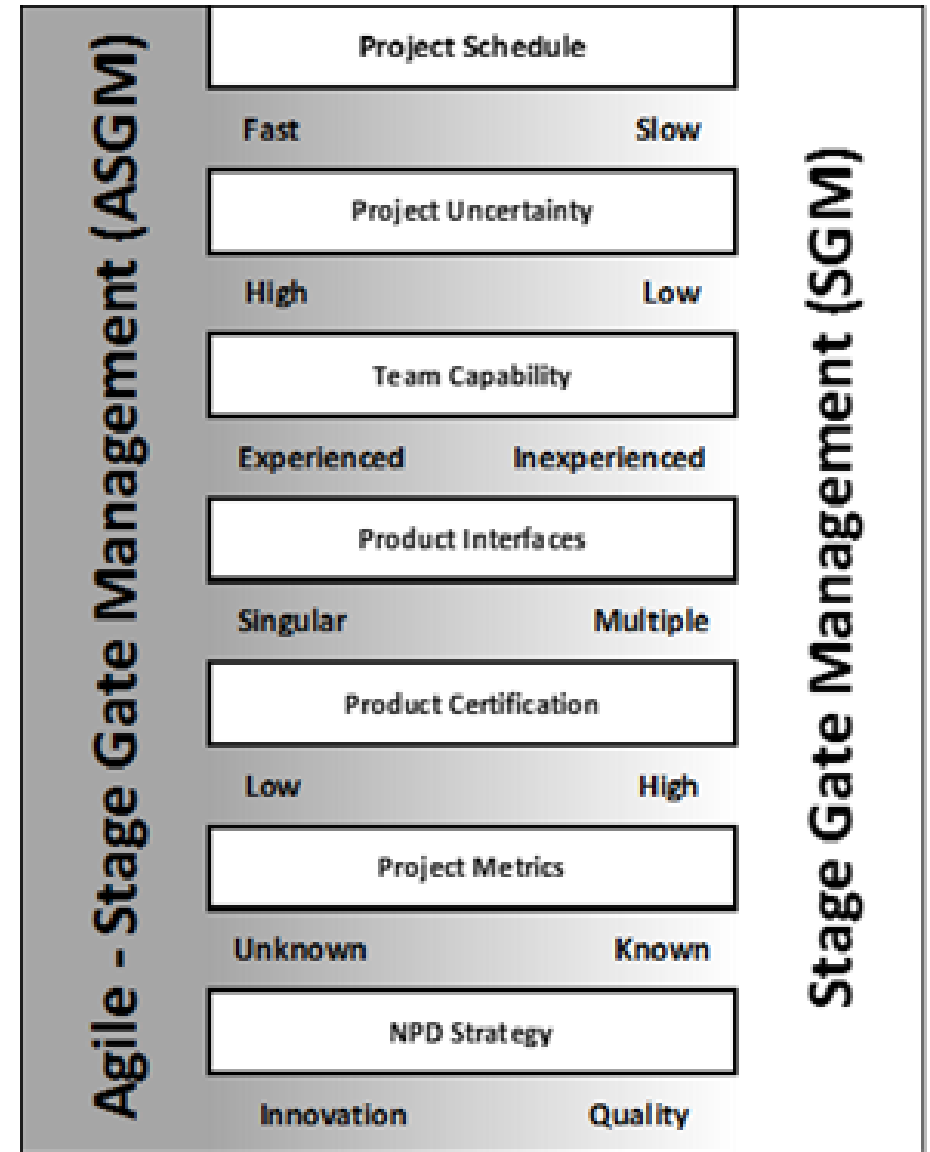
- Teams have used SGM, holding structured gate reviews w/ checklists, but…

    - …question SGM process 'weight' and applicability for higher risk endeavors and smaller projects

- Inflexibility and time to market concerns have driven BU's to implement 'Agile', but…

    - …largely an 'Intra-phase' approach, want clear project milestones and up-front planning

Insights

- Participants see a defined schedule and clear milestones as critical to success, but…

    - …want 'flexibility', late changes are discouraged

- Participants feel SGM (structure/language) are required for senior leadership, but…

    - …'re-training' not worth effort because Agile seen as 'open ended'

- BU teams delivering products using ASGM, but…

    - …coexist within a larger, non-Agile world

ASGM Model

- From case study analysis, SEVEN factors uncovered

- Traits that drove NPD teams from SGM to ASGM

- Functional model developed to describe behavior

- Also looked at WHICH Agile/Scrum techniques implemented

Agile – Stage Gate Management (ASGM) / **Stage Gate Management (SGM)**

Factor	ASGM	SGM
Project Schedule	Fast	Slow
Project Uncertainty	High	Low
Team Capability	Experienced	Inexperienced
Product Interfaces	Singular	Multiple
Product Certification	Low	High
Project Metrics	Unknown	Known
NPD Strategy	Innovation	Quality

ASGM Model

- Project Schedule

  - Time scale for commercialization – Short time frames lean ASGM; Longer ones lean SGM

- Project Uncertainty

  - Technological or commercial uncertainty – Uncertain leans ASGM; Known pathway leans SGM

- Team Capability

  - Experience/Capability of project team - Highly experienced lean ASGM; Mixed experienced levels lean SGM

ASGM Model

- Product Interfaces

  - Product complexity – Highly integrated systems team leans towards ASGM; Fewer product interfaces lean SGM

- Product Certification

  - Strict design certifications lean SGM; Less regulation lean ASGM

- Project Metrics

  - Known metrics leans SGM; Hard to define/different lean ASGM

- NPD Strategy

  - Innovation inclination lean ASGM; Reliability or product quality lean SGM

Summary

- ASGM positives:

  - Team alignment/engagement/accountability/communication

  - Project transparency

    - Driven by daily scrums, team location, project priorities, and demos

  - Customer orientation

Summary

- ASGM negatives:

  - Cost of dedicated resources

  - Difficulties for non-software projects

  - Up-front requirement ambiguity

- Vast majority of participants see value in ASGM and would use again

Next Steps

- Perform additional coding/theme re-organization

- Compile final case studies and perform cross-case analysis

- Refine ASGM Model

- Validate proposed ASGM model

- Write manuscript, defend dissertation, and graduate☺