

Value of Failure

Students Course

Module 2: What is Failure

Module 2: What is Failure

1. Definitions of Failure

- **Some Definitions:** Failure is used differently in different contexts
 - **General/common understanding:**
 - “Failure is the state or condition of not meeting a desirable or intended objective and may be viewed as the opposite of success.” (Wikipedia)
 - **Material Science & Mechanics:**
 - “In materials science or structural mechanics, failure is generally the loss of load carrying capacity of a material unit or structural element.” (Altenbach, Kolupaev)
 - **Information & Communication:**
 - “A system failure occurs when the delivered service no longer complies with the specifications, the latter being an agreed description of the system’s expected function and/or service.” (Laprie et al.)
 - **Business Science:**
 - “A situation in which a company or other businesses ceases operations because it is unable to generate sufficient revenue to cover its expenses.” (Financial Dictionary)

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1. Definitions of Failure

- **Consequences of failure:** Not every failure has the same nature
 - **Minor failures:**
 - Failures which cause damage of little or no importance
 - **Important or catastrophic failures:**
 - Failures which cause unacceptable damage

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1. Definitions of Failure

- **Categories of failure:** Failure on different levels
 - **Human failure:**
 - Human failure is a failure that occurs at an individual level
 - **Technical failure:**
 - Technical failure is a failure resulting from location or equipment
 - **Organizational failure:**
 - Organizational failure is a failure because of organizational rules, policies, or procedures

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1. Definitions of Failure

- **Causes of failure:** Errors that can cause failure*
 - **Assumption errors:**
 - an essential piece of information cannot be verified and is guessed or presumed
 - **Selection errors:**
 - two or more options exist, and the wrong option is chosen
 - **Capture errors:**
 - focus on a task is diverted elsewhere and an error goes undetected

*See Module 3: Causes of Failure

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1. Definitions of Failure

- **Risk & Failure:** Risks, success and failure are closely related
 - **Risks:**
 - Risks are potential events that have negative impacts on safety or project technical performance, cost or schedule
 - Risks are an inevitable fact of life – risks can be reduced but never eliminated
 - **Risk Management:**
 - Risk Management comprises purposeful thought to the sources, magnitude, and mitigation of risk, and actions directed toward its balanced reduction
 - **Note:**
 - The same tools and perspectives that are used to discover, manage and reduce risks can be used to discover, manage and increase project opportunities - opportunity management

*See Module 4: Preventing Failure

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1. Definitions of Failure

- **Design for failure?** A whole branch of product design is just about failure. Examples:
 - **Airbag Deployment Systems:**
 - The air bag system is designed to deploy in the event of an accident (failure of a system or component). Consistent deployment is vital in airbag designs. This means consistent failure of components that contain airbags is vital.
 - **Collapsible Steering Column:**
 - Volvo has designed a steering column that collapses down and away from the driver during a severe crash (system failure). Upon impact, the steering column structure fails in order to protect the customer.

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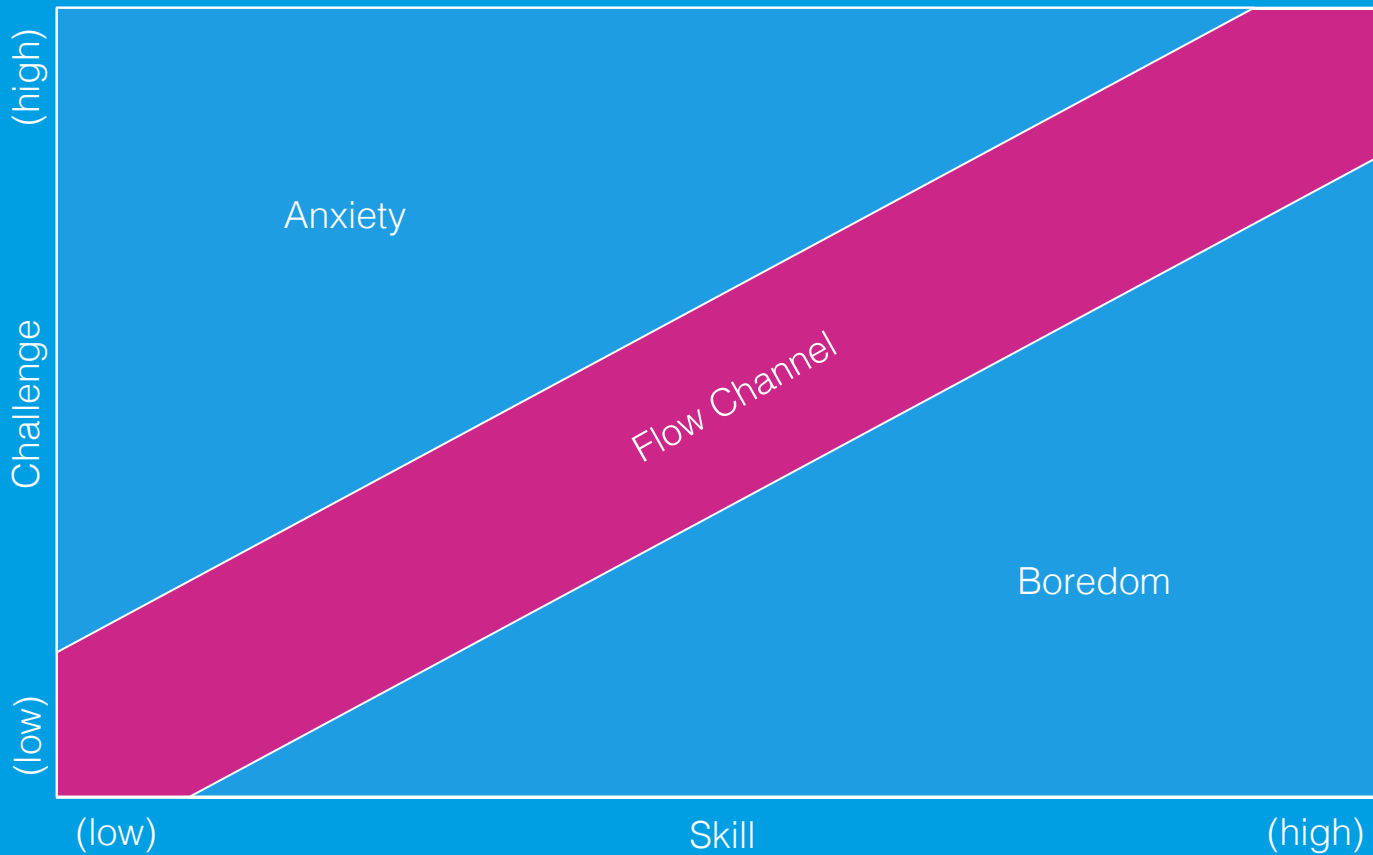
2. Opposite of success?

- **The Flow Channel:** How we react on tasks
 - Standard psychological explanation for the attractiveness of tasks and games
 - The challenge of a given task and the respective skills of a person form a narrow channel where fulfilling the task is attractive

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2. Opposite of success?

- The Flow Channel: How we react on tasks



Source: Csikszentmihalyi 1990, 74

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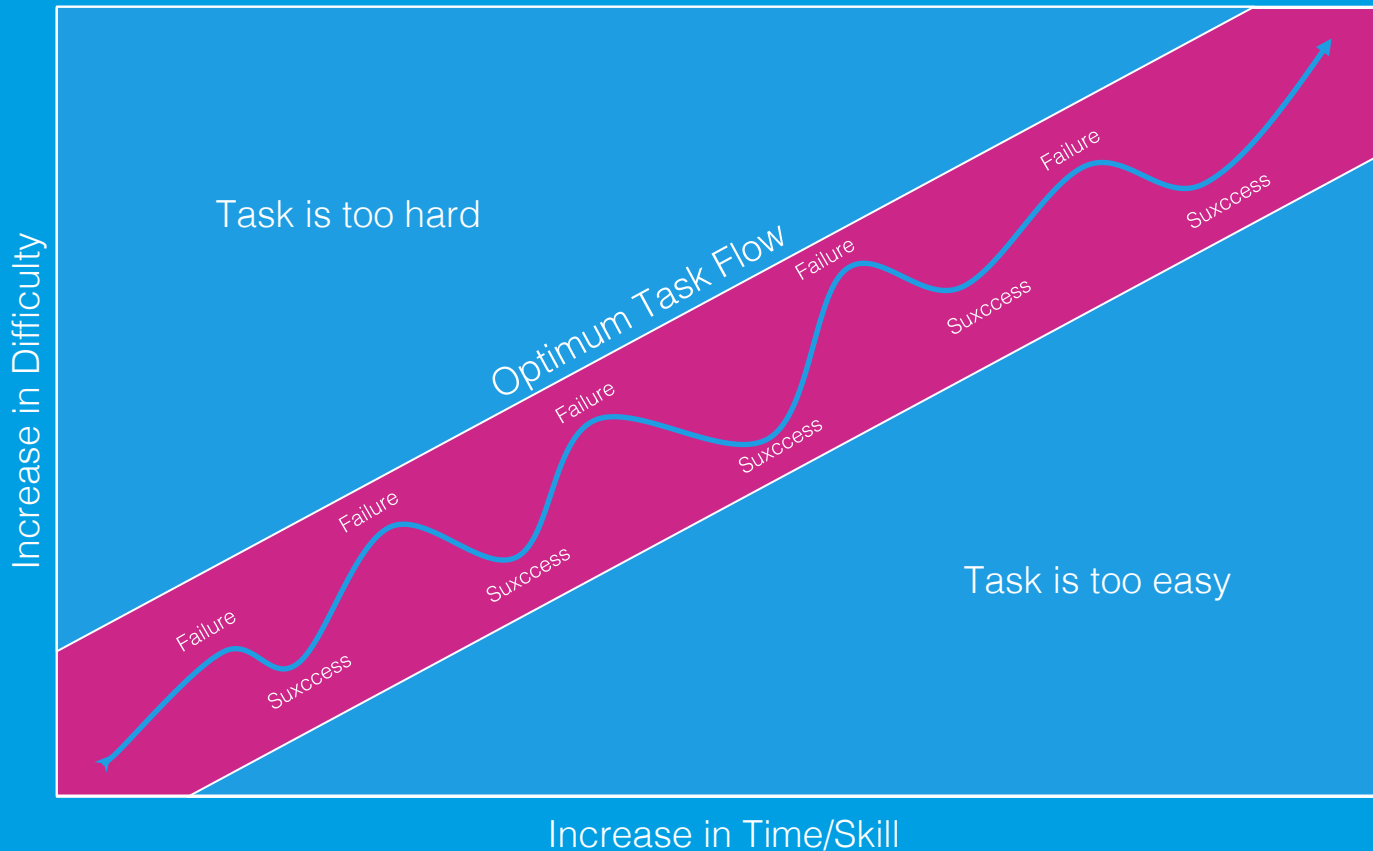
2. Opposite of success?

- **The Flow Channel:** What about learning?
 - Flow Theory suggests that we oscillate between anxiety and boredom
 - Assuming that we learn over time, the illustration suggests a smooth increase in difficulty of a given task to stay in the flow channel

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2. Opposite of success?

- **The Flow Channel:** Success, failure and learning are connected:



Source: Fallstein 2005, adopted

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2. Opposite of success?

- **The Flow Channel:** How we learn from tasks
 - An irregular increase of difficulty of a task leads to both, success and failure → and to **learning and increase of skills**

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2. Opposite of success?

- **Research Evidence:** Some results of related studies
 - Successful learning is associated with events when participants reached an impasse during problem solving (Lehn et al. 2003)
 - When undergraduates examine similarities and differences among contrasting cases representing a target concept, it prepared them to derive greater benefit from a subsequent lecture or reading on that concept (Schwartz/Bransford 1998)
 - Ill-structured problem solving and group discussions are significantly more complex and divergent than well structured counterparts. Even though less productive findings suggest a hidden efficacy in the complex, divergent process even though it seemingly led to failure – students from group that solved ill-structured problems outperformed their counterparts in well-structured conditions later (Kapur 2008).

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2. Opposite of success?

- **Success and Failure: Related or not?**
 - The optimum taks flow shows: suces and failure are both important for learning experiences
 - Only the **fear of failure** gives failure a bad touch in our mindset

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2. Opposite of success?

- **Fear of failure:** Why do we think failure is the opposite of success?
- **Fear of Failure...**
 - ...is one of the greatest fears people have
 - ...is related to fear of criticism or rejection
 - ...incapacitates people – is self-limiting

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2. Opposite of success?

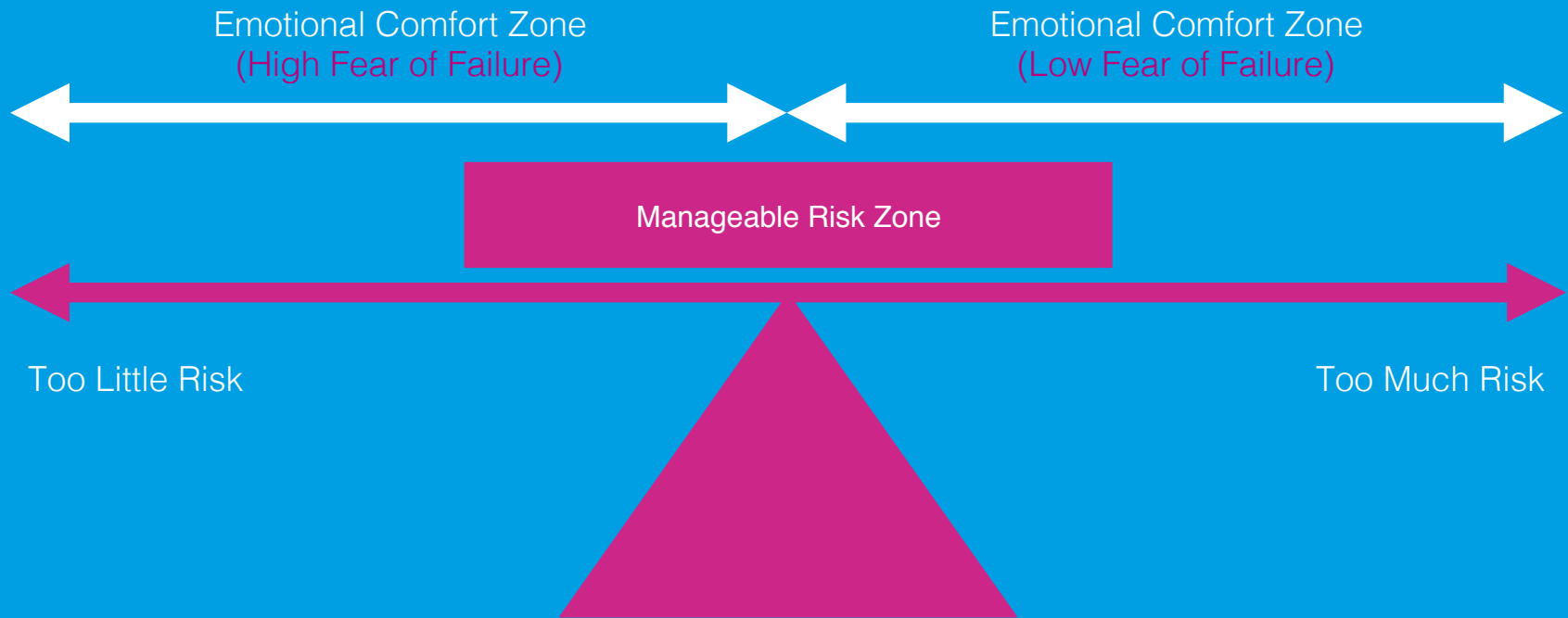
- **Fear of failure:** Too much and too less are both dangerous



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2. Opposite of success?

- **The right level of risks:** Your comfort zone depends on your mindset



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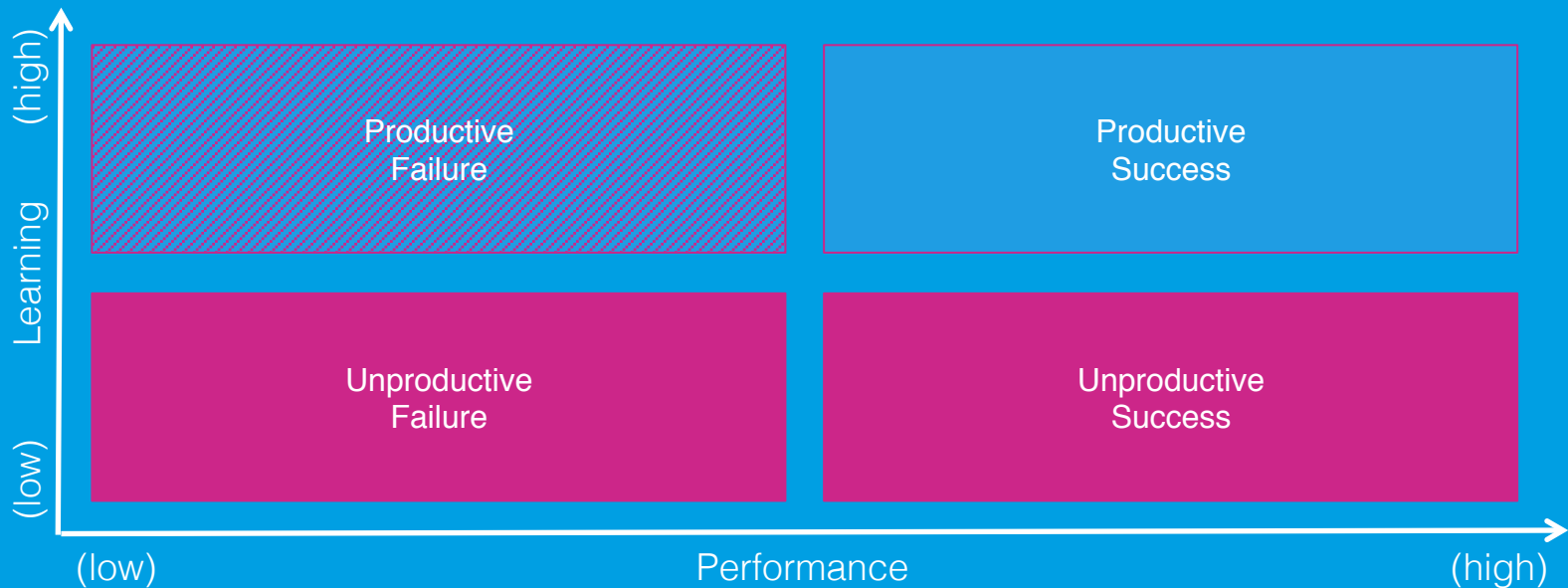
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2. Opposite of success?
3. Productive failure

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3. Productive failure

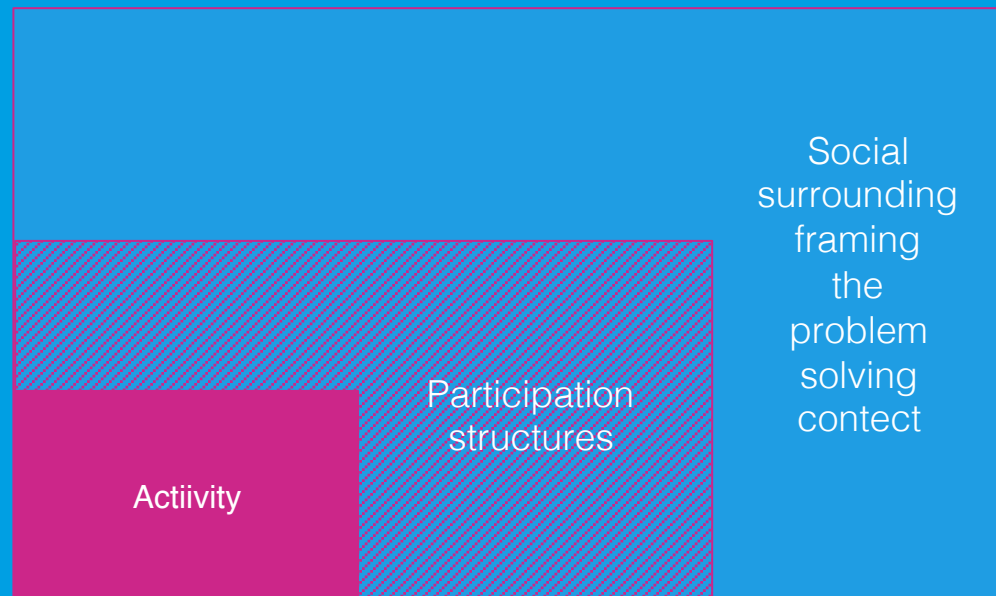
- **Success & Failure:** There is no just black and just white



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3. Productive failure

- **Productive failure:** To be productive, failure needs structure



Source: Kapur/Bielaczyc 2012, adopted

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3. Productive failure

- **Productive failure:** Layers of a productive structure
 1. Create problem solving contexts that involve working on complex problems that challenge but do not frustrate
 2. Provide Opportunities for explanation and elaborations
 3. Provide opportunities to compare and contrast the affordances and constrains

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Learned

- What we discussed today
 - how different definitions and categories of failure are
 - how different failures can be
 - the connection between success, failure and learning
 - that not every failure is bad
- Thank you for your attention

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