

Adaptive product development project planning to improve resilience

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Project Description:

Almost all businesses are moving fast from linear product development models towards Circular Economy (CE) models to produce environmentally more sustainable products. In this regard, front end innovation is critical because many product concepts and design-level approaches especially in new product development (NPD), significantly impact how the product can meet the expectations of the CE model (Koen, Ajamian et al. 2001). In a typical product development project planning, a predetermined set of activities and dependencies is assumed to be known and considered to be efficient and effective, but this is rarely the case for new radical product/ technology development projects (Lévárdy and Browning 2009), especially for physical product development that needs physical prototyping and testing (Tahera, Wynn et al. 2019). Front end planning of iterative design and testing are critical for new product development success (Cooper 2019, Liu and Tahera 2023). As a project progresses, planned activities may be found to be both insufficient and partly unnecessary (Lévárdy and Browning 2009). Therefore, the adaptability of a project plan to accommodate new activities suitable to new conditions is essential. However, little is known about how the traditional process needs to change.

In general terms, the adaptability of a system is a crucial mechanism for achieving resilience (Fiksel 2003, Bhamra, Dani et al. 2011). A system's resilience means the capability to return to a stable state after a disruption (Madni and Jackson 2009, Bhamra, Dani et al. 2011). However, the design of a resilient system is much broader than just recovering and returning to the previous state. Resilient system design is a proactive approach that enables the system to avoid disruption through anticipation, survive through withstanding and recovery, and grow through adaptation (Madni and Jackson 2009). To achieve adaptability to unexpected changes, a system needs to be reconfigurable in form (i.e., structure) or available capacity (Madni and Jackson 2009). A system's resilience can also be associated with reconfigurability and flexibility (Bhamra, Dani et al. 2011, Ivanov 2020, Bag, Gupta et al. 2021), along with many other terms found in the literature. Resilience and adaptability are also linked to the development and use of dynamic capabilities that are critical to the competitiveness and performance of firms and other organisations, especially in turbulent environments (e.g., Teece 2007; Mbalyohere et al., 2019). These dynamic capabilities have taken on more importance in strategic management in light of recent global turbulences, including the unprecedented pandemic and the war in Ukraine (e.g., Muneeb et al., 2023). As an example, approaches to business models have needed to accommodate these capabilities more explicitly (e.g., Randhawa et al., 2021). Still, it is not clear how these capabilities and associated terms are defined, implemented and quantified, and how their

impact is measured when applied to product process planning and the underlying managerial processes. This project will close this gap.

Consequently, the proposed project aims to investigate the concept of resilience in product development process planning for circular product development projects and the features that make such a plan adaptive. The research will inform future development of models for assessing how these features are related and how they behave and can improve resilience.

Methodology

A potential methodology could be based on case studies to identify and study critical factors that influence adaptability and resilience in process planning and associated variables from industrial settings. This may be preceded by a mixed-method approach starting with an 'experimental' simulation to assess how variables behave and are related. These simulations will help establish the framework, which will be validated using case studies. More about case study research methodology can be found in, for example, (Yin 2009) and (Bell, Bryman et al. 2018).

The student will be based in the Department of People and Organisations at the Business School, but will also work in an interdisciplinary team with the Design and Technology department based in the STEM faculty, The Open University.

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