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MANAGEMENT OF LIFE CYCLE OF INNOVATION TECHNOLOGIES

***Abstract.** Innovation Readiness describes the stage of business development for product, service, technology, or social innovations.*

***Keywords:** management, life cycle, innovation, technology*

An innovation life cycle includes two macro phases, being technological development and market evolution. Therefore, the innovation readiness level (IRL) concerns not only technological development but also market evolution, providing a framework for managers to position themselves and take into account key elements related to innovation throughout its life cycle.

In the innovation management process, both technology readiness level (TRL) and manufacturing readiness level (MRL) provide useful checklists of the key characteristics of the technological development phases, so that the risk associated with the development of the technology as well as the development of the related manufacturing processes can be properly and thus assessed and managed. However, innovation is not only associated with successful technological development (better known as "invention"). Innovation is rather a process involving a multitude of mutually dependent issues, in which not only technology, market and organization, but also other key issues need to be considered, such as partnership and risk.

The conceptual framework of IRL developed by Tao et al. (2010) comprises six phases (ie levels of training) and considers five key issues that determine the effective implementation of innovation, being:

1. Technology.
2. Market.
3. Organization.
4. Partnership.
5. Risk.

Consequently, the innovation life cycle is divided into six phases and, for each phase, associated aspects and evaluation criteria are identified, namely:

1. Concept: The basic scientific principles of innovation are respected and reported, and the feasibility of the technology is confirmed, which means that critical functions and / or characteristics are confirmed by experiments (equivalent to TRL 1-3), in addition, aspects of demand (such as customer needs and market demand) are observed and the first approaches are taken to work with top customers to confirm demand and strategic directions.

2. Components: The individual components are developed and validated by testing, and the prototypes are developed to demonstrate the technology (equivalent to TRL 4-6), in addition, the IP is protected, end customers are identified, business potential is analyzed with attention and a business plan with a detailed market launch plan is issued; from an organizational point of view, not only the technological risk but also the organizational risk are taken into account, an investment plan is initiated and the investment has started.

3. Completion: Technological development is completed and the full functionality of the system is proven in the field (equivalent to TRL 7-9), the IP is permanently protected, the technology / product is documented and its launch can occur once that are known the needs and requirements of specific clients, were predicted market segments, sizes and stocks, pricing and launch options were set based on careful market positioning, business modeling, and planning, which includes careful market analysis and competitive framework, creating partnerships, marketing, developing sales channels and customer relations, formalizing the corporate organization.

4. Abyss: Technology / product are introduced for the first time on the market, expertise is formed and positioned on the market, partnerships, sales channels, customer relations, marketing strategies are strengthened.

5. Competition: the market is reaching a mature stage, market positioning is maintained and improved (including through product innovation, differentiation of both products and services), the creation of new partnerships, etc.

6. Switching / closing: the market is reaching a declining stage and learning from experiences is based on strategic decisions made on technology re-innovation,

the opening of new markets, the transformation of the business model and the provision of corporate re-invention, to seek and develop a competitive advantage (change) or to enter the market alternately (closed).

In practice, the IRL is a comprehensive framework that describes the development of an innovation over its life cycle and can therefore provide a useful checklist of criteria for managing an innovation life cycle. In the combination of TRL and MRL, IRL is not just about technological development, which is just a key aspect of innovation, but also other key issues, such as the market, organization, partnership and risk, that determine the effective implementation of innovation. By ensuring better monitoring and control, IRL is intended to contribute to the more efficient implementation of life-cycle innovation and is therefore expected to be applied as a management tool. In this context, IRL is applicable at both company and project level.

In particular for the purpose of project monitoring and evaluation, the IRL is therefore considered to be a more comprehensive measurement system / systematic measurement than the individual TRL or MRL (or even combined with each other), although the latter two are equally important for the evaluation of specific aspects of technological development.

However, IRL alone does not provide the necessary information to managers of organizations to make informed strategic decisions, nor to project coordinators for monitoring and evaluating the performance of a project, if IRL is not combined with other appropriate tools. As mentioned, it is rather a checklist of criteria to be met before taking the next steps in an innovation lifecycle, and in this regard it can be extremely useful, but it should be based on a few other more practical tools that need to be applied to provide specific information and that are fundamentally needed for detailed risk assessment. Provided that the technological risk is properly assessed, due to the completion of the various steps provided for in the TRL and MRL frameworks, business planning is also considered an essential practical tool to ensure an effective assessment of the risks inherent in starting a new business or launch of a new product on the market once there are the conditions to do so.

References:

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