

**SUMMARY OF INNOVATION MODELS ON A COMPANY LEVEL – CREATING
A FRAMEWORK FOR AN INNOVATION MODEL THAT WILL INCREASE A
COMPANY’S INNOVATION ACTIVITY**

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1. Introduction

Innovation models are being used so that companies can manage their innovation processes which have evolved tremendously in the last few decades of the XX century. Companies can adopt an existing model, or they can create their own [1]. When companies use an innovation model, it is easier to manage the order in which innovation activities happen. It also helps with determining the resources and responsibilities for every stage of the process as well as deciding which methods and tools companies will use. Innovation as a process has a very dynamic character, and the models of innovation have transformed throughout the years. Innovation models can be on a company level or a national level (such as National Innovation Systems – NIS) and can also be adopted and used by a region, an economy etc. This paper focuses on the company level innovation models, where we are suggesting a framework for an innovation model that can be highly applicable to all company sizes. Our main goal is to increase the innovation activity and increase a company’s innovation performance with this model.

2. Innovation models and their characteristics

Currently there are six known generations of innovation models. Rothwell’s five generations of innovation models give a historical perspective of innovations management that shows how innovation models have transformed from linear to complex interactive models [3].

• *first generation of innovation models - linear model of innovation (technology push)*. Main phases of this type of models are: 1) basic science/fundamental research; 2) design and engineering; 3) manufacturing; 4) marketing and 5) sales [11,12]. This is a period where a lot of resources were put towards the R&D in companies, because it was believed that the more R&D is done, then more new products will be out. This pushed innovations forward, but did not give enough attention to the transformation process of existing products [13] or the needs of the market place and the consumers [14].

“Technology-push” model:



“Need-pull” model:



Fig. 1. Rothwell’s Diagram (source: Godin, 2013)

• *second generation of innovation models - linear model of innovation (market pull/demand pull)* is not much different from the first one. Both lack feedback loops, but this one recognizes the fact that including the market/consumer needs will help drive performance and will be a source of ideas for new and better products/services [15]. Both models are shown in Figure 1 and these are the technology push and need pull models suggested by Rothwell. The *stage-gate model* was predominantly used by NASA in the 1960’s while trying to find creative innovative ideas to send a man on the Moon. This model, further simplified and suggested by Cooper [16] consists of five relevant phases or stages (as shown on Figure 2), and the added controlling elements here are the *gates* positioned after each phase. Their function is to follow the fulfillment of strict and predetermined criteria before we move onto the next stage [17]. Many other companies have adopted and used, or are still using, this model [18].

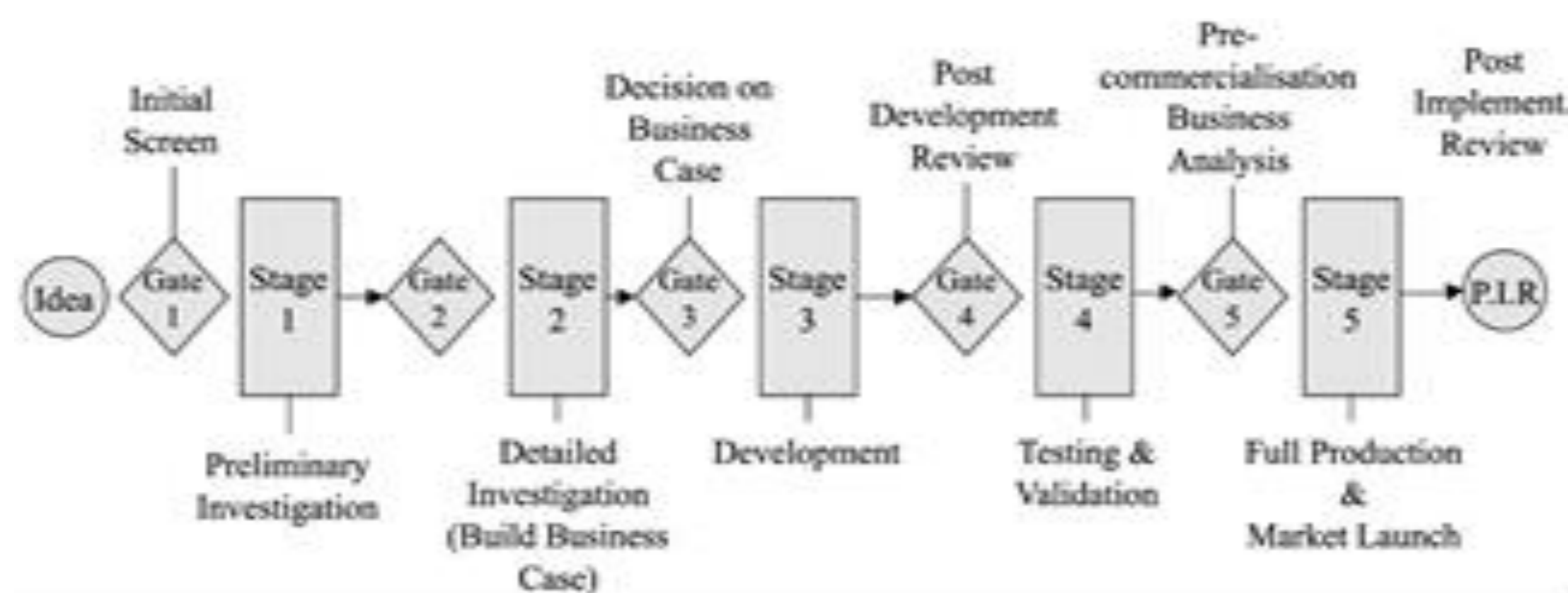


Fig. 2. Cooper’s Stage Gate Model (Source: Cooper, 1994)

• *third generation of innovation models – interactive models* differ from the first and second significantly. Got their name as a result of recognizing the interaction between elements in the innovation process which is a key for innovation’s success. The technology push and market pull models are “coupled” in this generation which implies suppliers and customers to be closely “coupled” in product development teams [19]. The models include interaction and feedback between phases such as the marketing research and the other elements in the linear process [20], but could not differentiate the need from the demand. The *Coupling model of Mayers & Marquis* (as shown in Figure 3 [21]) is a third generation innovation model, where the innovation activities are divided in subcategories under each phase, and all of them are interacting [22].

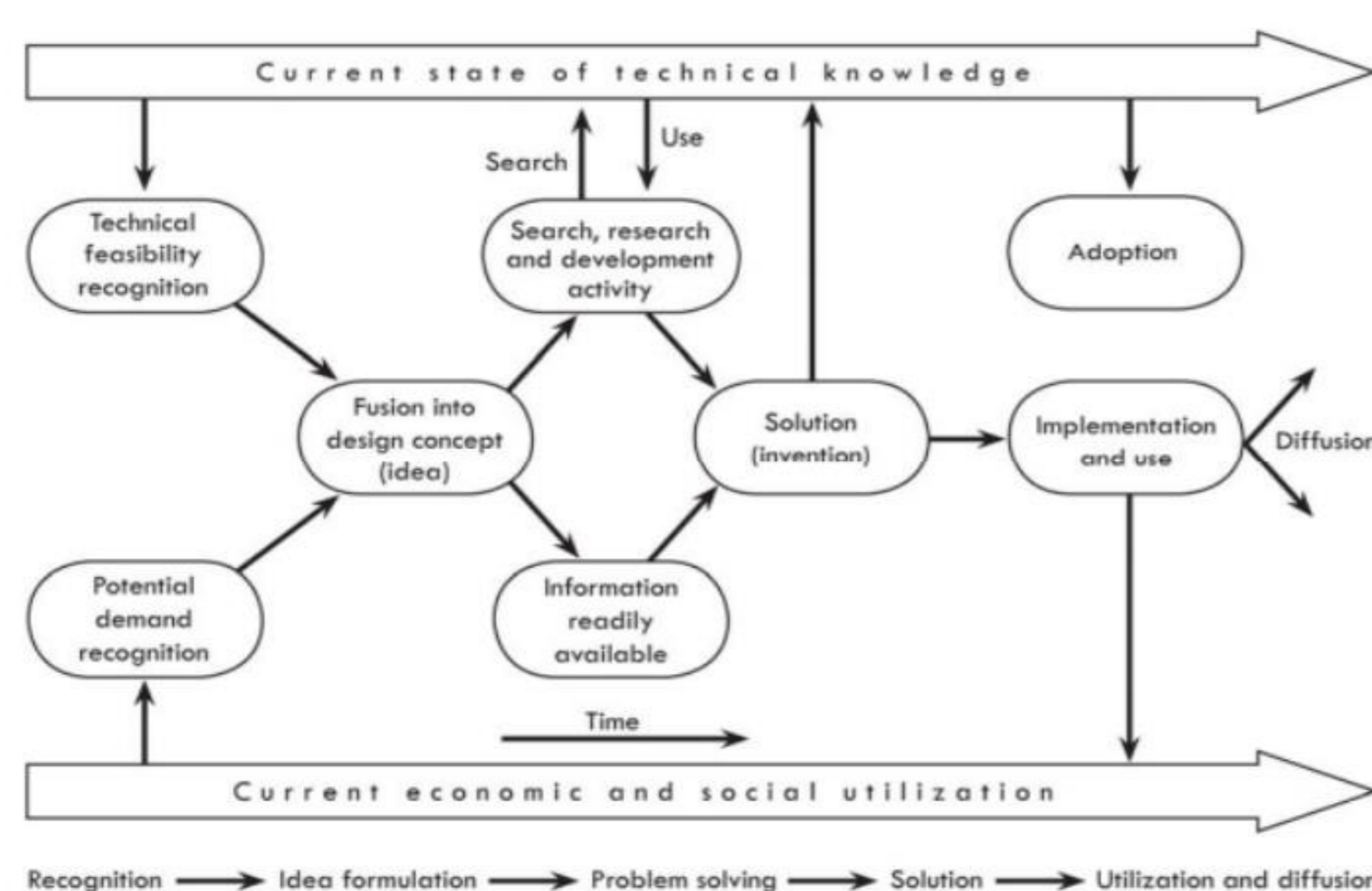


Fig. 3. The Mayers and Marquis Coupling Model from 1969 (source Godin, 2013)

• *fourth generation of innovation models* corresponds to the Japanese perception of the innovation process and it was the answer to the need of replacing the linear model with a different model that can reflect the complex innovation process [23]. The models from this generation consist of the basic stages of the linear models of innovations, enriched by many feedback loops and interaction between the stages, as well as a validation of the knowledge gained in the innovation process [24]. On Figure 4 is the *Chain-Linked Model*, developed by Rosenberg and Kline (1986).

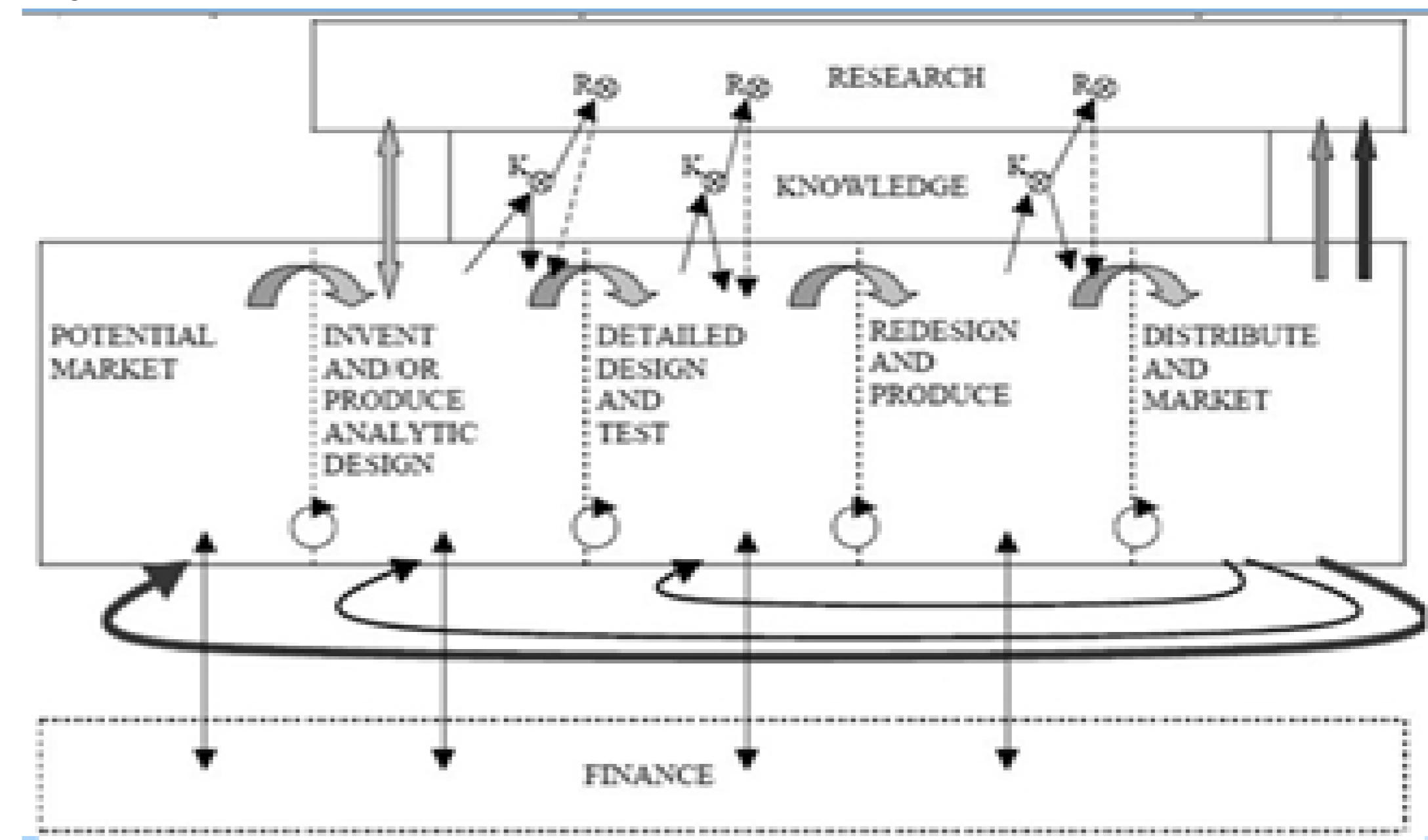


Fig. 4. The Chain-Linked Model of Innovation (Rosenberg and Kline, 1986) Source: www.uis.unesco.org

• *fifth generation of innovation models - Rothwell’s SIN (Systems Integration and Networking) model* as a fifth generation innovation model incorporates the higher integration inside companies as well as with the outside entities such as suppliers, consumers, universities and authorities [28].

• *sixth generation of innovation models - The Open Innovation Model (Figure 5)* underlines idea management not just within the organizations, but also with other organizations. R&D is being done by outside partners, if it is not possible to be handled by the company itself, and ideas can occur while developing a new product/service which can change the course of the process. This model promotes using outside knowledge, such as suppliers, competition, entrepreneurs, scientists etc. [29].

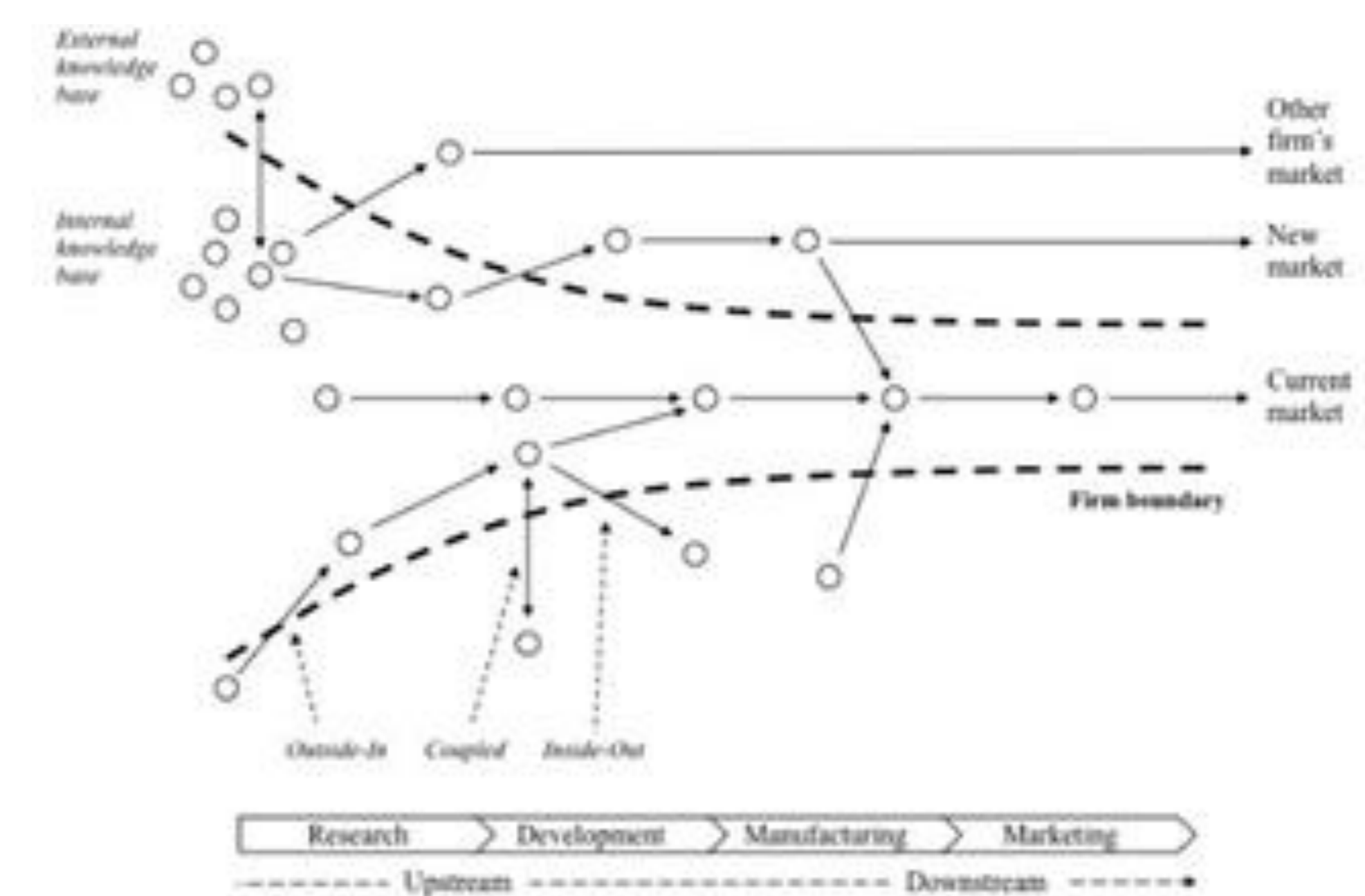


Fig. 5. The Open Innovation Model (Chesbrough, 2014)

3. Discussion

What we have learned from the six generations of innovation models is that a good innovation model has to have *predetermined phases, feedback loops, large capability for interaction and integration*, but also to be *knowledge based*, able to use outside knowledge, endorse knowledge gain and maintain the knowledge level in the company through achieving a continuous learning culture. Because the feedback loops were lacking in the first and second generation of innovation models, and customer’s feedback is an essential element of innovation, we consider them as a part of every stage of the innovation process. Another element for a successful innovation process is *networking*, which will help companies of all sizes, not just the large ones that can afford their own R&D, to be able to innovate and enter new markets. This will also help in the effort of *knowing the competition* and keep in tune with the technological advances. *Identifying new sources of ideas* is crucial for generating innovative ideas, that has been used for the first time in the second generation of innovation models, where market pull became the main source of ideas.

Planning a *reliable and safe funneling of ideas* and their distribution will encourage innovative minds to take part of the process and share their ideas and knowledge. The *selection process* of innovative ideas should be done by strict criteria and very carefully, and the model should be able to know whether it is the *right time* for introducing a certain innovation on the market or not. This should be enabled by using *marketing, legal, economical and development component* as a part of the process, where the marketing component can determine whether an idea can be marketable or not, the legal component will deal with the patenting potential of the innovative idea that can be an additional source of income and potential success, the economic component will be able to say how economically feasible the new idea is and whether we can use outside R&D facilities or other entities to help in the process; and the development component the actual R&D of the idea before bringing it to market and getting to the *realization and diffusion* stages.

4. Conclusion

The transformation process of the innovation models show that innovation is of a changing nature and very complex. In order to suggest a new model that can help companies innovate more in regions with a low innovation activity trend, we need to take in consideration that no innovation can happen if the *company culture* doesn’t enable this itself. For companies to become more innovative, they need to be *ready for change* and to have set up mechanisms that will support the process.

We can state that in order to have an innovation model that could be widely applicable to different types and sizes of companies, the model itself should be of a simple and maybe with a certain linear character, but with enough details that are going to clearly describe the innovation process. The main phases of the innovation model should be marketing, legal, economic, development, realization and diffusion phase, integrated with feedback loops, and potentially modified with other predetermined phases. It should include measures and tools for evaluation of feedback. The model should also be knowledge based, easy to adapt to a networking environment, handle interaction, know the competition and easily identify new sources of ideas that will be funneled through a predetermined channel. Achieving a continuous learning culture should be an integrated part of the model. As a beginning of the innovation process we can say that generation of ideas is the most important part, as well as planning a reliable and safe funneling and distribution of the same ideas.