Currently, the topic of innovation generates a lot of interest around the world. Innovation is considered an essential part of the solution to creating more jobs and improving socio-economic conditions of many countries around the globe. Innovation comes about through the existence of many interrelated solutions to socio-economic problems in an extensive interconnected network, which create value for each other. Such a complex creativity and innovation value-creating network is here called an Innovation Ecosystem (IECO). The main objective of this dissertation research is to improve the current understanding of the innovation ecosystem (IECO) by developing a model that uses a broad set of relevant static and dynamic variables and incorporates the principles of system dynamics (SD). The proposed model is based on the relationships between 91 variables and combined influences of the 43 parameters. Available data for 32 countries, representing a full span of GDP worldwide, was used to study the level of innovation in each of these countries. The result of the developed model is a novel ranking of the level of innovation through a dynamic innovation index, called the DII. The DII is a new tool to evaluate innovation and entrepreneurship level of a given country in the context of global economy. The most significant differentiator from other existing indexes of innovation is that the DII is focusing on the entrepreneurship qualities taking into account the social context, as well existing entrepreneurial culture and innovation attitudes and the mentality of each of the considered countries. According to DII-based ranking, the ten most innovative countries in the world are 1. Switzerland, 2. USA, 3. Finland, 4. Netherlands, 5. Iceland, 6. Sweden, 7. Germany, 8. Denmark, 9. The United Kingdom, and 10. Austria.