This paper focuses on a network structure and innovation with using patent citation data of lithography. The effect of network on R&D has been examined in studies of product development and network theory. However, less considered is the strategic management of network in existing literature. This paper aims to suggest strategic implication based on technological network analysis.

Is the valuable innovation generated in technological crowding or sparse network? I hypothesize that sparse network will prompt to generate an original innovation, because sparse network doesn't have redundant information (Burt, 1992). I use US patents of lithography for the analysis. Lithography is composed of numerous parts, and it is difficult for a manufacturer to develop it without avoiding other firms’ patents.

I identify a technological network from patent citations. A patent is a node, and a citation is a tie for a network. Whether a patent is a peripheral or a central technology depends on a number of citations which the patent accepts after being issued. The less citation a patent accepts from the following patents, the less valuable it is. Also in terms of citations, there are two types, self citation and non self citation. Self citation is that a firm A cites her own past patent. I regard the seven patents as core technologies, which Nikon claimed that ASML violated in 2001. Unless they are core technologies, Nikon would not have to sue ASML for the infringement. I draw two types of technological networks from patent data, core technologies’ network and peripheral technologies’ network, and I show common factors in each type.

I assume the following three points as a result from the analysis. The first point is that egocentric network structures of seven core technologies have multiple structural holes, and their originality is prompted by fresh information exchanges. The second point is that there are less self citations in egocentric network structure of peripheral technologies compared to core technologies.

Significant technology with sparse network and more self citations suggests to more focuses on the value R&D projects with less ties with other projects.

Reference