

The article “**Technology Networks and Choice**” by Karel Mulder is a research work in the social processes within the institutions that influence the course of technological development. The author uses the example of high performance fibers to illustrate this theory.

The technologies that are created by modern industrial corporations are neither fully determined by profit maximization nor by the course of nature, but also socially determined choice plays an important role. For instance, the development of new technology in chemical industry can be divided into four phases which represent the basic subjects of **choice**:

- **Introduction into a research domain**: Identification of the research domain where expertise can lead to important achievements for the corporation (needs, independency, innovation, satisfaction...). Early enters are called ‘**pioneers**’, while ‘**followers**’ entering after evidences of its possibilities, and which benefit from pioneers’ weak relations.
- **Product development**: Selection of one of the possibilities offered by a research domain which will set up the basic features of the product to be developed.
- **Production processes**: Choices in all stages of product live cycle, which will define the transformations between the purchase of materials and the end-use of a product.
- **Industrial scale plant construction**: This choice generally involves the allocation of very large amounts of resources and taking large risks for the corporation as a whole.

A corporation does not always necessarily have to go through all of these choices by itself: technology can be bought or copied. In addition all these choices have dependencies and might contain **feedback** loops. Just the last choice often has a formalized character.

The classical approach of profit maximization underlies in a normative conception of the economy as a perfect market place. Here, corporations become ‘**atomized**’: unfissionable elements, without any bonds with other corporations and without internal divides. All people in the corporation act in accordance with the corporate strategy. However, the various ambitions and interests of individuals should be beard in mind, as well as external relations.

Development of new technology involves **cooperation** of several units of the organization. To introduce a new product, R&D, marketing and sales, and engineering have to cooperate intimately in order to be successful. The conflicting views and different interests because of the various functional backgrounds cause the need for **negotiations** to establish cooperation.

‘**Technology network**’ refers to the **ensemble of the relationships which serve the objective of developing, maintaining and applying a new technology**. It might involve people at various levels in the corporate hierarchy, and in various hierarchic lines negotiating and communicating; where soft skills, corporation resources and influence are present. **Agreeing** on mutual roles is essential in establishing relations between actors.

The creation of a technology network might be seriously affected by organizational characteristics. Geographical distances or the absence of mechanisms to divide the rewards of the technology to be developed may also play a role. Corporations may recognize these barriers and balance them. Technical networks can be rather different and specific features might influent the four choices described. Characteristics of technology networks listed below:

- Extension – number of actors participating in the network. A large network does not necessarily mean a stronger network because it can also lead to more problems.
- Variety – functional origins of the actors within the network. More variety is assumed to lead to increase network strength.
- Prominence – actors could be more powerful with a centrality role in the network or by their prestige. A centrality actor will have a larger influence of the choices.
- Strength of relations – the relations between actors might be multiplex because they interact not only about technology but also private. One-level interactions, uniplex, tend to turn in to be multiplex over time. Higher strength of relations leads to stabilization.
- Integration – integration is low if the actors in the network are not interrelated. Higher integration leads also to stabilizing effects.
- Singular actors – a unique actor which would be the only supplier. They can not act as a monopolist because of the network relations, instead they are prestigious actors. They have a high influence of the choices about new technology.
- Secrecy – to keep the relation secret could lead to advantages for actors.
- Resources – lack of specific resources is a reason to establish a relation with an actor. Resources could be all from equipment and raw material to patents and know-how.
- Weak relations – the actors needs a lot of information from other actors. Relationships with only information exchanges are not long lasting and not intense.
- Environment – a source of opportunities for extensions or threats that challenge could the strength of the network.

The technology networks influence the development of new technology in two ways, by **ensuring the survival** of a technology and by **influencing the choices**. The strength of the technology network ensures the survival of a technology. A deeper, more specified, **agreement** on roles and also trust lead to a stronger relationship. **Trust** in partners could be created by **multiplexity** of relations but also by fulfilling a role. The strength can be influenced by tradition, history and private relations, factors that are summarized as the **corporate culture**. The survival of a technology is also influenced by the number of options that actors had for reacting to changes in the environment. The extension, variety, flexibility, integration and amount of resources of a technology network contribute to these options. These characteristics might be considerably influenced by the **organizational structure** and can be improved by merging with a larger network or being absorbed.

Especially the choices of product and process determine the content of new technology. Extending networks could imply changes in various relations and roles which actors do not like. **Optimization** of the use of available (internal) resources influences the better outcome of choices. The prominent and singular **actors** are also able to influence the choices considerably because of their position in the network.

A technology network takes time to build up but leads to better adoption of changes. In the early stages of development, relations with academic scientists are important to acquire information. Later, capital and budgets are far more important. Organizational boundaries influence access to a technology network. For the survival of projects, the strength of the network, which depends on several network characteristics, is very important.