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# Shaping technology, building society; the industrialization of the Norwegian cod fisheries

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ABSTRACT

After the Second World War the Norwegian government planned a large scale modernization of the entire fishing industry in northern Norway. The industrialization of the land-based processing industry and the construction of a totally new trawler fleet gained massive public financial support. The new technological adaptations were built around a vertically integrated corporate model. As a reference to the modernization concept, the seasonal coastal fisheries were defined as outdated and not able to meet the modern expectations of full-time employment and improved salaries. In this context, the trawler fleet was supposed to feed the processing industry with stable supplies of fresh fish and thus secure a fully vertically integrated production model. However, almost from the start, the model never functioned according to the political goals, i.e. an economically viable sector with secure and stable employment. Instead, the project was characterized by efficiency problems, internal disputes between the fleet and the processing factories, institutional inertia within the public sphere and finally a decoupling of the entire model. This article outlines how deep-sea trawling originally gained acceptance in the political landscape, how it developed over the years (1950–2013) and how the technological development finally was uncoupled from the needs of the processing industry. The article explains this development through the idea of technological changes as socially constructed and modified, emphasizing that successful technological transformations have to be in line with basic social values and perceptions.



## 1. Introduction

In terms of catch value, export income and employment the North-East Arctic cod (*Gadus morhua*) represents the most important fish resource in Norway.[1] Throughout history the cod fishery has constituted the cornerstone of the socio-economic fabric along the coast, especially in the north [2]. Furthermore, besides for the herring fisheries, the cod fishery has served as an important reference for the development of a comprehensive fisheries management regime and important institutions, such as the Institute of Marine Research (IMR) and the Directorate of Fisheries (DOF) [3,4].

While approximately 35 percent of the cod resources are allocated to the deep sea trawler fleet, the remaining part of the global quota is earmarked to the coastal fleet, mainly located in rural districts. The social and technological adaptations of the coastal fishers are characterized by fishing trips of short duration (one day), simple and open technologies and a management regime especially adapted to cope with different artisanal gear adaptations, such as gill nets, long-lines, Danish seine and hand line [5,6].

An important feature is that the coastal cod fishery is heavily dependent on the cod's biological behavior.[2] During the period from January to April each year, the mature part of the cod stock migrates to a limited area off the North-Norwegian coast (the Lofoten area) for spawning. Consequently, a large part of the cod resources is easily available for artisanal fisheries. The rich cod resources in combination with strong natural fluctuations have implied that the seasonal adaptations have been able to flood the market with fish for a relatively short period (most often up to three months). The traditional land-based processing industry has thus been adapted to handle high volumes within a short period of time, an adaptation which has locked the industry to traditional production forms, such as salted fish and dried fish (stockfish). In this manner, the seasonal peaks have put constraints on the cod

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[1] In 2011 the total catch value from Norwegian fisheries peaked 16 billion Norwegian kroner. The catch value from the cod fisheries was 4 billion kroner [1].

[2] The cod fisheries constitute the main income for the coastal fisheries. Conventional gears, such as gill net, long-line, Danish seine and hand line dominate [7].

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sector's possibility of creating stable employment for the workers in the industry. Furthermore, the industry has been characterized by lack of innovations, a limited product mix and a vulnerable dependency on a few export markets. This has in turn implied that the cod fisheries have been a major source of social and economic conflicts [8]. Regardless of the organizational constraints, the vulnerable technological adaptations and the large seasonal variations have been seen as the main structural obstacles for the modernization of the entire whitefish sector [9].

Since the 1930s and especially during the post-war period, organizational and technological transformation processes for the industrialization of the whitefish sector have thus continuously been on the political agenda. The general goal has been to turn the entire value chain into a year-round industry. The new strategy was based on land-based fillet production and freezing technology aiming towards higher paying and more stable modern consumer markets, primarily in Europe and in the USA [10].

During the 1950s and 1960s the new strategy gained political acceptance, and several land-based fillet factories were established along the coast of northern Norway[3] [12]. In addition, more than 60 new trawlers were built with generous subsidies. While the trawler fleet was organized as separate shipping companies, profound changes in the legislative regulations regarding ownership, the land-based industry became the sole owners of this fleet.[4] Thus, although the integrated value-chain was organized as two separate entities (fleet and processing), the new corporate model represented a fully vertically integrated strategy. Compared to the traditional coastal vessels, the new trawlers represented a totally new dimension in the Norwegian fishing fleet [13].[5]

However, the industrialization of the cod sector was never able to fulfill the political aims of the modernization project. In retrospect, the new model produced weak economic results and a permanent conflict between the fleet and the processing plants [9]. Since the models infancy, efficiency problems in abroad based manner and steady demands for new structural reforms have been part of the ongoing discourses [16–19].

Today, more than 50 years after the start of the industrialization process, many rounds of state interventions and internal restructuring, the modernization concept is reduced to a fraction in terms of numbers of trawlers and land-based processing plants. Consequently, many participants in the fisheries political discourse are seriously questioning the legitimacy of the industrial concept [20]. Should we still continue to throw public money to a sector that has failed so badly over all these years?

This article focuses on the historical background of the present dilemma. How did the large modernization project end up with a dramatically reduced, unprofitable processing industry and a privatized fleet with very limited obligations to the original owners, i.e. the factories and fishing communities? The article pays special attention to the *introduction of the deep sea trawler fleet*, how the fleet gained acceptance in the political landscape and the interplay between the fleet and its owners; the processing industry. The paradox that the most advanced fishing fleet technology over time became completely decoupled from the processing industry that the fleet was designed to serve is discussed. Furthermore, the study looks more closely into the framing conditions, which seem to have undermined the original project. Finally, the possible options open to the political authorities are discussed, acting under the important constraint that technologies can only partly be politically managed.

The article is based on our own work with this industry for more than 30 years (see [21,22] for a broader presentation) and other analysis of the trawler fleet, e.g. [23,24]. The article is divided in 8 sections, where the next (second) offers the theoretical background, while the third section gives the historical background. The fourth section deals with how the trawler fleet experienced the transition from open access fisheries towards strict regulations. The fifth section outlines the structural changes within the trawler fleet, while the sixth section outlines the changes in regard to ownership of the industrialized segment. The seventh section accounts for important institutional- and global changes to the industrialized concept. The last Section 8 outlines the usefulness (and limitations) of using a technological approach to the development of a particular sector, and the possible options available for political authorities, given the uncoupling of fleet and the processing factories. The guiding idea has been to continue the pioneering work of Sagdahl [13], who wrote the history of the trawlers up to the end of the 1970s. Together we are dealing with the spectacular rise and fall of one of the largest modernization projects in modern Norwegian history.

## 2. Fisheries technology as social constructs: a conceptual framework

The introduction of a deep sea trawler fleet and the new concept of land based filleting freezing plants represents a paradigmatic shift in terms of new technological adaptations to the ground fish resources in the Barents Sea [13]. In Norway, conflicting debates of fisheries technological adaptations have always been high on the political agenda [25]. Such discourses, where influential stakeholders manage to define which problems to be addressed and how to solve them, can be described as a *framing process*. According to Bijker [26], a frame is a boundary, and framing is the process of producing this boundary. The concept of technological frames refers to the ways in which relevant social groups, like e.g. fisheries organizations, fisheries authorities, regional interests or powerful industry stakeholders attribute various meanings to the broad concept of fisheries technology. The on-going discourses are thus composed of the concepts and techniques employed by a community in its problem solving, e.g. the tension between the coastal and the deep sea, industrial fisheries models. The concept of technological frames should thus be read as encompassing the recognition of what counts as a problem, the strategies available for solving the problems and the requirements a solution has to meet. This makes a technological frame into a socially constructed combination, reflecting current theories, tacit knowledge, engineering practices and bargaining among legitimate stakeholders, representing different values and norms.

The theory of interpreting technology as social constructs suggests that the reason for acceptance or rejection of a given technology, e.g. deep-sea vessels or coastal vessels (fishing with passive gear), can be found by examining society [27]. Actors within the field of social constructivism have been concerned with moving the central explanatory concept away from the individual inventor (or technical "genius") and technological determinism, by removing the strict distinction between technical, social, economic and political processes of technological adaptations.

From this perspective, it is not enough to explain the success of a given technological adaptation by saying that it is simply

[3] Based on three main companies (Finotro, Findus and Brødrene Aarsæther), 12 large fillet factories were built. During the 1970s, nearly 80 percent of the entire work force in the Finnmark county were employed in the land-based fish processing industry [11].

[4] The general regulation, still valid, is that only active fishers may own fishing vessels.

[5] In addition, 12 factory trawlers with on-board production of fillet, 9 salt-fish trawlers and several smaller trawlers were built. While the vast majority of the trawler fleet were owned by the processing industry in northern Norway, the factory- and salt-fish trawlers were located at the north-west coast and owned by private companies [14,15].