Digital history re-reading of Finnish industrialization
Digital distant & cultural close reading of technology transfer, diffusion & use in Finland, 1880 - 1910

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1. Introduction

Our proposed long-term research project will study the reception of new innovations. We will investigate the modernization of Finnish society and how modernization was experienced by contemporaries. In particular, we will analyse changes associated with technological change.

Two main aspects of these changes inform our research. Firstly, we are interested in the concrete transformation of the material environment and how that created new possibilities for people as seen through people's use of technological innovations. Secondly, we are interested in the connection between introduction of new technologies and changing mentalities; what is expected of a new innovation and what kinds of hopes and fears does it create for the future?

In this project we will study the introduction, dissemination and use of a number of central technological innovations associated with modernization during the Finnish industrial breakthrough during the late 19th and early 20th centuries. We also aim to demonstrate the promises and challenges of the larger project through one pilot study modeled on our DHH work. This pilot study was conducted on the introduction and diffusion of the light bulb as represented in the Finnish technical journals of 1880–1910.

2. Our case study: the introduction of the electric light bulb

Nineteenth-century Finland was one of the latest countries in Europe to industrialize. During the 19th century it was largely agrarian and sparsely populated, with vast natural resources. With a large agrarian sector and a limited industrial and manufacturing sector, electrification seemed to confer only limited advantages for the majority of the population.

During the 19th century a new kind of light source, an electrical one, appeared. The development of the electric light was varied and thus cannot be credited to any

single individual or institution. Electric lighting came in multiple forms and eventually one outshone the others: it proved the most usable, easiest to manufacture and most reliable - the incandescent light bulb. The invention of the incandescent light bulb is often credited to Thomas Alva Edison (1847–1931) and/or Joseph Wilson Swan (1828–1914), but according to historians Robert Friedel and Paul Israel there was at least 22 different iterations of the incandescent light bulb before the one that Edison presented in 1879.

The promise of a constant, safe, and affordable new light source was exciting. In addition to the newly introduced incandescent light bulb, another version of the electric light - the arc light - was in use. Also old forms of lighting, such as gas light, was also in wide use in 19th century Finland.

Introduced to Finland in 1882, the incandescent light fits the time frame of our source material. However, it was not the only lighting method at the time, as it lived in tandem with other iterations of the electric light and gas lighting. Edison's version, and the technical improvements on it, triumphed eventually and became the standard for early electrical lighting in Finland as well as elsewhere.

2. Research questions and methodology

The proposed long-term research project will study the adoption, implementation and reception of novel technologies in Finland. We are interested in the cultural changes taking place within Finnish society and the technical society and whether these changes can be observed in the context of the three Finnish technical journals. We are also interested in mentalities and value judgements attached to new technologies and the possibilities these were expected to confer.

In our study we aim to answer the following questions:

1) How were new technological innovations appropriated in the context of modernization by the professional technical community in the late 19th and early 20th century Finland?

2) Where and in what kinds of places were associated with new technical innovations both in their foreign and finnish applications, and what does it tell about the Finnish society and its applications of and its attitudes toward new technical innovations?

3) How can digital humanities methods such as data mining of technical journals bring light to changing attitudes toward new technological innovations?

Our research is a digital humanities project which combines qualitative methods and data mining. We will use computational methods to locate articles that deal with new technologies.

Our aim is to obtain frequency data on the occurrence of keywords related to new technologies in the three journals. Our hypothesis is that these keywords will indicate the geographical and temporal diffusion of new technologies from other countries to Finland and within Finland. Co-occurrence analysis will yield data on which words co-occur with our key words (*n*-grams for some $n > 50$). Manual analysis of co-occurring words will allow us to focus on particular semantic aspects, such as place names, names of persons and value words. We will subject these collocation lists to a combination of cultural analysis (close reading) and computational methods. Methods relevant to our project include:

- Exploratory data analysis and data visualization
- Geo-visualization
- Context analysis using Singular Value Decomposition (SVD): frequency matrices give us a representation of semantic space and identify clusters within the data
- Context analysis using Latent Semantic Analysis (LSA)
- Topic modelling
- Cultural analysis

3. Source material: three technical journals

Our main sources are three Finnish technical journals 1880-1910 from DIGI - digital collections of the National Library of Finland: the Swedish-language *Teknikern* and *Tekniska Föreningens i Finland Förhandlingar*, and *Suomen Teollisuuslehti* in Finnish. There are a total of 1603 journal issues in our data.

Teknikern was published between 1891 and 1931 and it came out twice a month, it was published by *Finska kemistsamfundet* which was founded the same year, 1891.

Tekniska Föreningens i Finland Förhandlingar was published 1880 – 1958 and behind the publication was Tekniska föreningen i Finland, a society that was founded in 1880, making it the oldest technical society in Finland.

Suomen teollisuuslehti was being published in 1882 – 1910 by its founder Josef Stenbäck (1854 – 1929) who was a Finnish architect and engineer.

In addition to these technical journals our material consists of Finnish and Swedish language newspapers from our designated time period.

4. A Very early disposition

1. Introduction

2. Research questions and sources

3. Background
   3.1 Historical background of the time period
   3.2 Background of the authors

4. Appearance of new innovations in the journals
   4.1 AMAZING DATA FINDINGS HERE
   4.2 EVEN MORE AMAZING DATA
   4.3 Interpretation of the amazing data

5. Something wise
   5.1 very wise words
   5.2 a possible breakthrough in the history of human thought?
   5.3 Stuff. The good kind.

6. Conclusions

7. Bibliography