

Article

Paimio Sanatorium under Construction

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Abstract: Alvar Aalto created innovative architecture in his breakthrough work, Paimio Sanatorium, located in Southwestern Finland and designed between 1928 and 1933. This empirical case study looked at the iconic piece of architecture from a new angle by implementing the actor-network theory (ANT). The focus was on how the architecture of the sanatorium came to be. A detailed description of the chronology and administration of the building process enabled observing on the role of the agency of the architect. The study surveyed the cooperation, collaboration, and decision making of the agency during the construction period. The first part of this paper focused on the relations and conditions of producing the sanatorium and analyzed the building through drawings and archive material; the second part linked to the actor-network theory of Bruno Latour and included a discussion on how Aalto managed to bring along the other actors. The study clearly showed the importance of a collaborative effort in a building project. The most special architectural solutions for Paimio Sanatorium, a demanding institutional building project, came into being in circumstances where the architect managed to create a viable network that merged collective competence with material factors.

Keywords: Alvar Aalto; Modernism; Paimio Sanatorium; Finland; Bruno Latour; actor-network theory; history of technology; history of architecture; building history

1. Introduction

Alvar Aalto created innovative architecture in his breakthrough work, Paimio Sanatorium, located in Southwestern Finland and designed between 1928 and 1933 (Figures 1 and 2). His fellow Siegfried Giedion canonized the sizeable institutional building by evaluating it as one of the three most important of the inter-war period in the extended edition of the *Time, Space and Architecture* (Giedion [1941] 1949).

This empirical case study was an attempt to look at the iconic piece of architecture from a new angle by implementing the actor-network theory (ANT) to architectural research. The focus was on how the architecture of the sanatorium came to be. A detailed description of the chronology and administration of the building process by using archive material enabled observation on the role of the agency of the architect. The paper surveyed the cooperation, collaboration, and decision making of the agency of the architect. The focus was on the construction period, between the initial design stage and the completed building project. The first part of this paper focused on the relations and conditions of producing the sanatorium and analyzed the building through drawings and archive material; the second part linked to the actor-network theory of Bruno Latour and included a discussion on how Aalto managed to bring along the other actors.

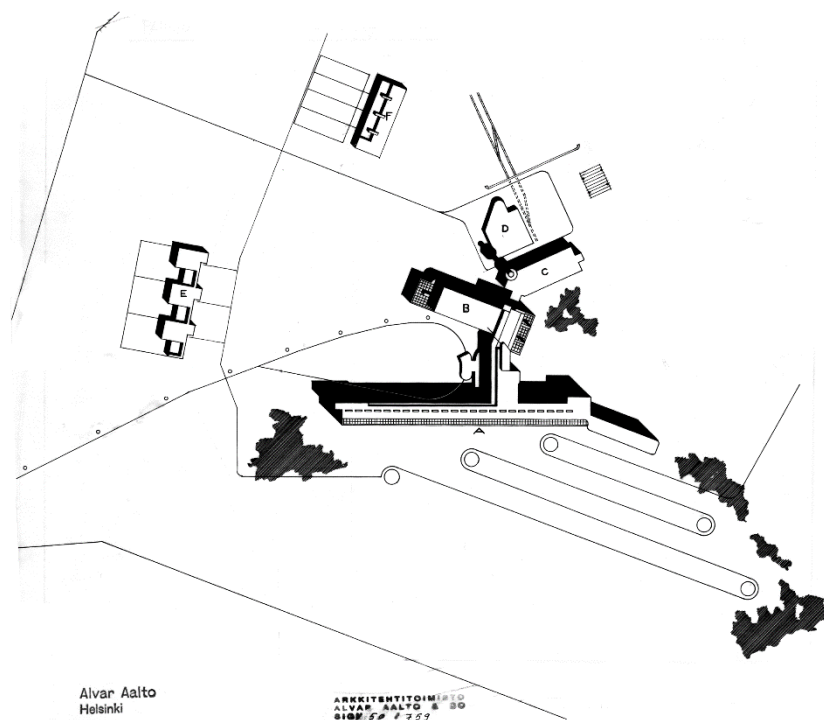


Figure 1. Site plan showing the main building and its wings (A–D), the Junior Physicians’ and Administrative Director’s terraced house facing the hospital entrance (E) and workers’ apartment building (F). Detail of drawing No. 50-759, the drawing has been edited. Alvar Aalto Museum. Used by permission.

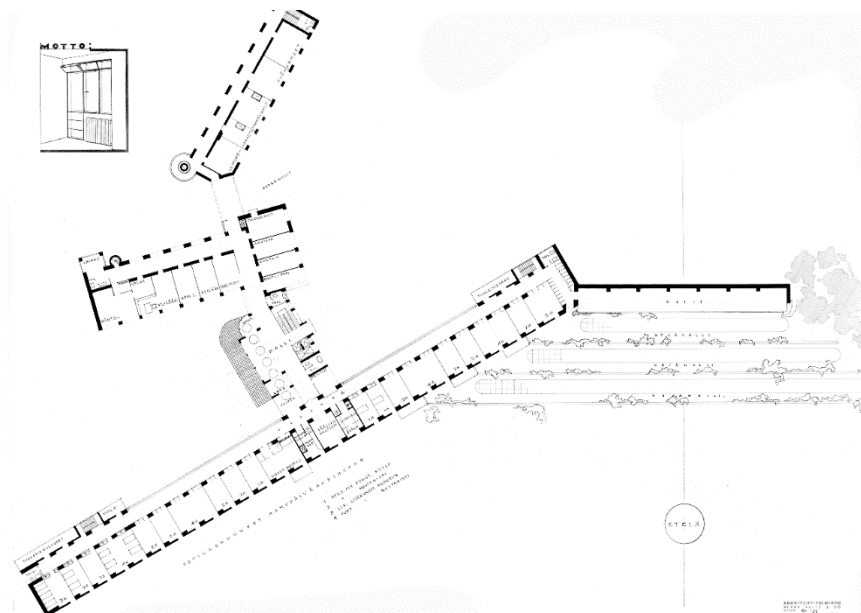


Figure 2. The main building ground floor plan of the competition-stage design of the Paimio Sanatorium from 1929. The patients’ rooms were located along the 100-m long corridor of the A-wing. The B-wing housed mostly common functions such as the dining hall and the doctors’ reception area. The top C-wing was a serving wing with a kitchen and a staff dormitory. Drawing No. 50-25. Alvar Aalto Museum. Used by permission.

This study attempted to mobilize ANT to discuss the relationship between architecture and technology. Architecture as an applied form of art expresses itself symbolically. A building is a

“resulting construct of many heterogeneous ingredients, a long process, many trades and subtle coordination necessary to achieve such a result” (Latour 2003, p. 87). It also forms a framework for solving practical problems and is concurrent with architecture (Colquhoun 1962). Hence, both architecture and a building designs are inevitably cultural objects, tied to time and place.

Aalto drew influences from the culturally-radical Modernist discourse during the sanatorium design period and got an invitation to join CIAM in 1929. He aimed to incorporate the international intellectual culture into his professional domain (Pelkonen 2003, p. 9). Since the beginning of his career, Aalto was an active writer. Even so, CIAM made a profound impact on Aalto as he now became acquainted with the already renowned ideologists such as Walter Gropius and Le Corbusier. Aalto started domesticating new concepts both in the architectural media and in the daily press in his home country. Also, his style of life, which he brought up in some articles, emphasized modernity. Through these actions, he became considered a spokesperson for the new Continental architecture trends in Finland in the turn of the 1930s.

Certain technological systems in construction, such as the concrete frame, electricity, air conditioning, and lifts, developed rapidly in the inter-war period in Europe, and architects faced new challenges. The areas of expertise of engineers and architects began to differ from each other. However, architects still held the position of top experts in the major building projects.

The client of the Paimio Sanatorium project, the Federation of Municipalities of Southwestern Finland, had set a Building Board and Building Committee to take care of the decision-making processes during the construction period. Aalto became a specialist member of these decision-making bodies and a supervisor of the highest rank. Additionally, his agency signed a contract for the architectural and interior design work. In this dominant role, Aalto also contracted some of the notable specialist engineers and manufacturers directly. In some cases, the designing engineers became part of the process through contractors.

In the 1930s, Aalto had promoted the project vigorously in the architectural press. Aalto’s articles and design efforts revealed his areas of interest, whereas the close reading of the minutes of the Building Board and Building Committee meetings of the project exposed the critical questions that caused debates. These two matters shaped the direction of this study.

Few researchers of architecture have mobilized actor-network theory. Latour himself, together with architecture professor Alben Yanneva, co-edited an article dealing with the problem of buildings looking desperately static. Their article aimed to make visible the movement of architecture, meaning the view of a structure as a series of transformations. They also made a point on “the Euclidean space of drawings being a subjective and knowledge-centered way of grasping entities, which does no justice to the ways humans and things get by in the world.” (Latour and Yanneva 2008). The Norwegian design historian and professor Kjetil Fallan made several essential distinctions in his discussion of the potential of ANT in architectural research. He summarised that the most apparent site for action in architecture is in planning, design, and construction, and the other would be architecture in use and mediation (Fallan 2008, pp. 81, 93). The Swedish architect professor Mattias Kjærholm has pointed out the duality of spatial artifacts, such as buildings, in his dissertation. Spatial objects can be seen both as networks or actants. In the first case, they are outcomes of translations made within a system of actors. In the second one, they have an active role for example in shaping social processes (Kjærholm 2004, pp. 124–54; Fallan 2008, pp. 84–87). Similar remarks of the dual roles of architecture have been made by other scholars of architectural history and theory, only outside the framework of the ANT (e.g., Adams 2008, p. xvii; Forty 1984, pp. 61–93). Kjærholm also criticised Latour’s preoccupation of controversies as the location of dynamics and suggested that ANT could be a helpful perspective to study the ordinary (Kjærholm 2004, p. 152; Fallan 2008, pp. 84–85). Latour’s research fellow Michael Callon’s term *translation* focuses on the communication strategies in the construction of facts and artifacts (Callon 1986). The concept has inspired the Norwegian political scientist, professor Marianne Ryghaug, in her study of green architecture. She could provide detailed knowledge of the values and actions of architects in design and building projects. She has also pointed

out some outcomes of less successful translations (Ryghaug 2002; Fallan 2008, p. 86). The Swedish professor in architectural history and theory Claes Caldenby recently emphasized the need to consider architecture and engineering alongside with the humanities and social sciences in the research of construction history in Nordic countries.

2. Producing the Sanatorium

2.1. The Reinforced Concrete Frame

Full structural systems of reinforced concrete were not commonplace in public buildings in the early 1930s in Finland. Aalto's articles revealed his deep engagement in working with the relatively new material (See for example Aalto 1928, 1933). The winning competition entry of the Paimio Sanatorium project embraced reinforced concrete structures and was one of the first distinctly Modernist winners of any architectural competition in Finland. The tectonic challenge was sublime for a young architect (Figure 3). As architects were not trained to make the structural calculations, Aalto needed to find a skillful collaborator in the extensive sanatorium project. Aalto convinced the Building Board to contract an independent expert as a structural designer. Allowing the contractor to make the structural calculations was a more widespread practice at that time.



Figure 3. The patient wing building site in autumn 1930. The A-wing pillars on the external wall line were cast in situ and protected by a bricklayer. Photographer Alvar Aalto or Aino Marsio-Aalto. Photo No. 50-003-079. Alvar Aalto Museum. Used by permission.

The previous joint projects of Aalto and the construction designer Emil Henriksson had been successful. The professional respect must have been mutual, as Aalto's innovative projects had allowed Henriksson to show his skills and present the outcomes in the media. Henriksson's article on steel concrete slabs without beams showed pride in their collective work on the Turun Sanomat newspaper building (Henriksson 1927). Henriksson, in turn, was well connected in the business circles of Turku, where Aalto had only recently moved. The influential contractor Arvi Ahti was Henriksson's business partner, and they had collaborated on several major developments in Turku. Moreover, the men were brothers-in-law.

Aalto's agency contracted Henriksson in May 1930 directly, after the Building Board had approved a budget for the work. It is possible that Henriksson had consulted Aalto already during the competition 18 months earlier. The contract tender round followed some weeks after contracting the designer.

In May 1930, the Building Board published a call for tenders, and received nine bids of the construction of the reinforced concrete skeleton. It decided to base its decision on the most economical price and started negotiations with three contractors. A contractor who shared the third place was left out of the talks. Tektor, a significant company, had made the most economical bid. In the contract negotiations, which Aalto led, it came out that Tektor had not taken into account the masonry work of the chimney and would need to raise the bid. Still, Tektor's revised proposal was the least expensive and the Board decided to accept it. At this point, the building contractor and master builder Arvi Ahti, whose bid had been placed fifth, informed that he had made a mistake in his calculations by including the masonry work, and was interested in lowering the price. The Committee considered that Ahti's announcement did not lead to further measures. Aalto continued the negotiations with Tektor until it turned out that the concrete work of the rear wall of the sun balcony was not included in their bid as it was only presented in Aalto's final drawings. The minutes do not reveal whether Aalto presented new plans at this point. When no agreement was reached, the negotiations ended. Finally, the Board accepted Ahti's proposal, as it was feasible in their view (Heikinheimo 2016, pp. 174–81).

The construction of the reinforced concrete frame commenced and was completed in November. The frame construction was based on architectural drawings, work specification, and structural drawings, which were made after the contract was signed. Henriksson's design work proceeded simultaneously with the molding of the reinforced concrete frame. Aalto and Henriksson supervised the work as fully authorized representatives of the client (Heikinheimo 2016, pp. 174–81).

The Building Board did not debate the fact that the reinforced concrete frame exceeded its budget quite substantially. After all, Aalto's solution, which allowed sunlight to flood deep into the building frame, appealed to the medical experts. He used section drawings to show medical experts how rays of sun reached the farthest corner within the structure (Figure 4). As Aalto had succeeded in first persuading the medical specialist of the superiority of his concrete frame design, the lay members of the Building Board voiced no doubts on this issue. The solution became consolidated. Interestingly, another illustration exemplifies the architectural intention of making a cutting-edge structural solution; in other words, another aspect of the same design (Figure 5).

2.2. The Horizontal Health Window

The patient room windows were an essential and salient architectonic feature in the sanatorium for the legislator. A new Act which guaranteed 50 percent state financing to public sanatorium projects came into force in 1930, and the Paimio Sanatorium, officially the Sanatorium of South-Western Finland, was one of the first ones to receive this subsidy. The patient room window design underwent a complete overhaul and changed from a steel window to a hybrid wood and metal window. Aalto also developed the window as a holistic concept from the competition phase onwards. Aalto's approach was comprehensive, and he integrated both the heating and ventilation systems into the solution. The floor-reaching structure also allowed for amounts of daylight, benefiting the patient. In Aalto's words, the patient room window had the following characteristics, among others: "Morning sun on the patients' beds; afternoon sun on the front part of the room, in front of the window. Double-glazed windows in wood with L-shaped frames, with permanent ventilation through glass panes with vertical openings. Exposure to the sun can be adjusted using external blinds . . ." (Aalto 1932a, p. 80). In the same article, Aalto discussed the idea of continuous ventilation, albeit the timber-framed window was not designed to be kept continuously open in Finnish weather conditions. With this rhetorical gesture, he wanted to demonstrate his expertise in the overlapping trends in healthcare and architecture.

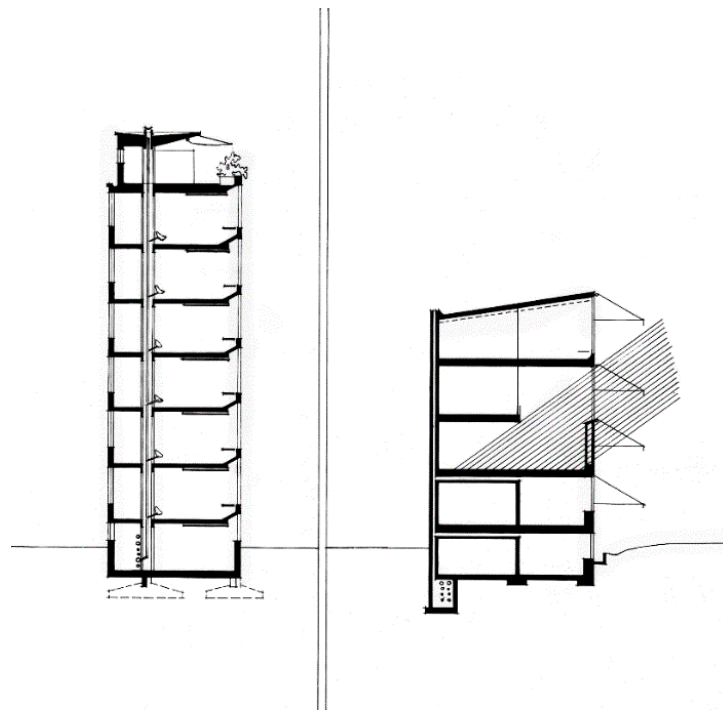


Figure 4. Aalto could convince the skeptic medical experts of the quality of his design by using a section drawing. In the diagram, sun rays penetrate deep into the building frame of the B-wing and leave no dark corners. As sunlight and fresh air were part of the cure for lung tuberculosis patients, Aalto's solution seemed a purpose-built concept. Drawing No. 50-764. Alvar Aalto Museum. Used by permission.

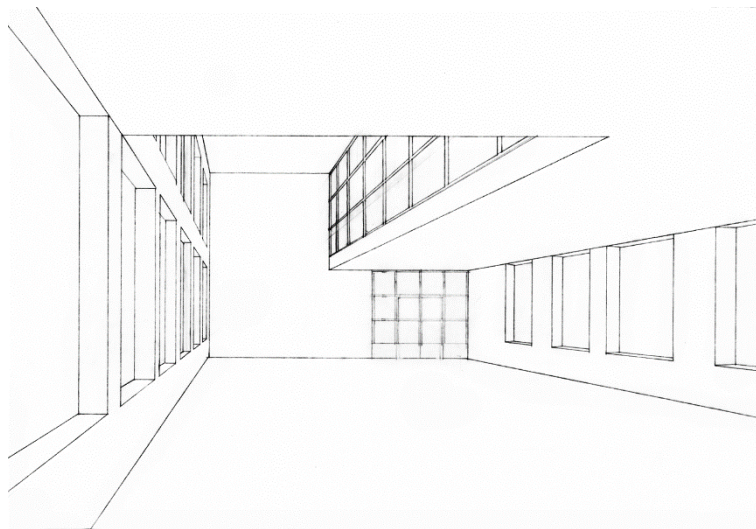


Figure 5. The perspective drawing illustrates Aalto's architectural intention, a new kind of hanging reinforced concrete slab of the dining hall. The wall of the mezzanine floor facing the dining hall was composed of glass, which made the structure look cantilevered, floating and weightless. Drawing No. 50-226 detail. Alvar Aalto Museum. Used by permission.

Aalto was more interested in using industrially-produced, shallow-profile steel windows than standard wooden windows (Figure 6a,b and Figure 7). In the early stages of the work, the Building Board had agreed on the use of steel windows on the condition that they were Finnish. However, Finns needed to import the steel profiles, and in the recession of the early 1930s, the public projects had to favor the local production and workforce. For this reason, Aalto never invited tenders from

window manufacturers abroad, whose products he had used in his former work. Made-to-order steel windows manufactured in Finland out of imported profiles too expensive. When the final decision was made not to equip the patient rooms with steel windows, Aalto developed a new type of wooden window that employed some steel profiles. The window resembled remotely a traditional ventilation window, known as the “health window,” only this time it was horizontal in orientation.

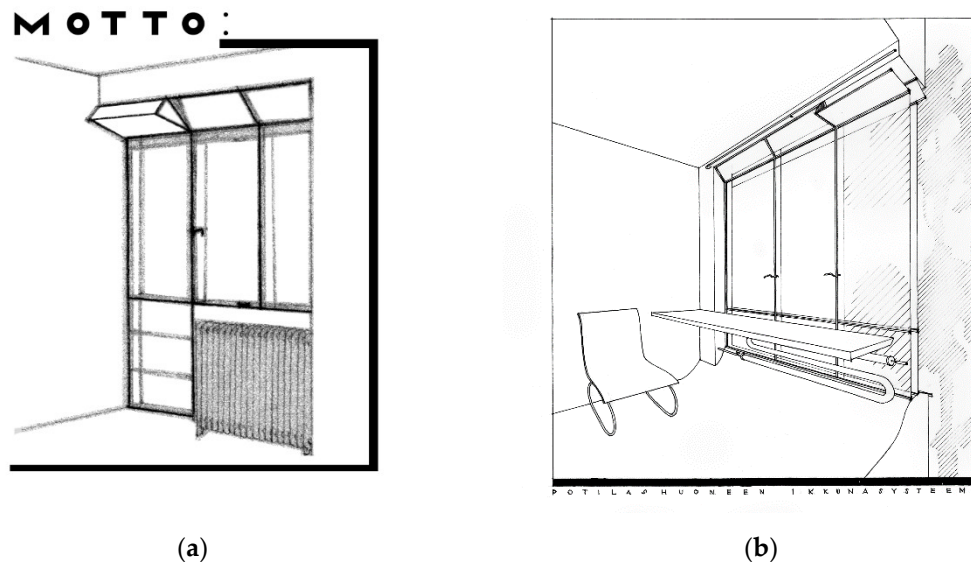


Figure 6. (a) The vignette image of the competition-stage asymmetrical design in 1929 depicts the first version of the patient room window. Detail of drawing No. 50-655, the drawing has been cropped. AAM; (b) One step later in the design process, the standard drawing shows that the bottom edge of the window section was level. The architect also changed the shape of the floor so that it curved upwards near the window. Visually the window reached the floor. Drawing 50-395; the drawing has been cropped. Alvar Aalto Museum. Used by permission.

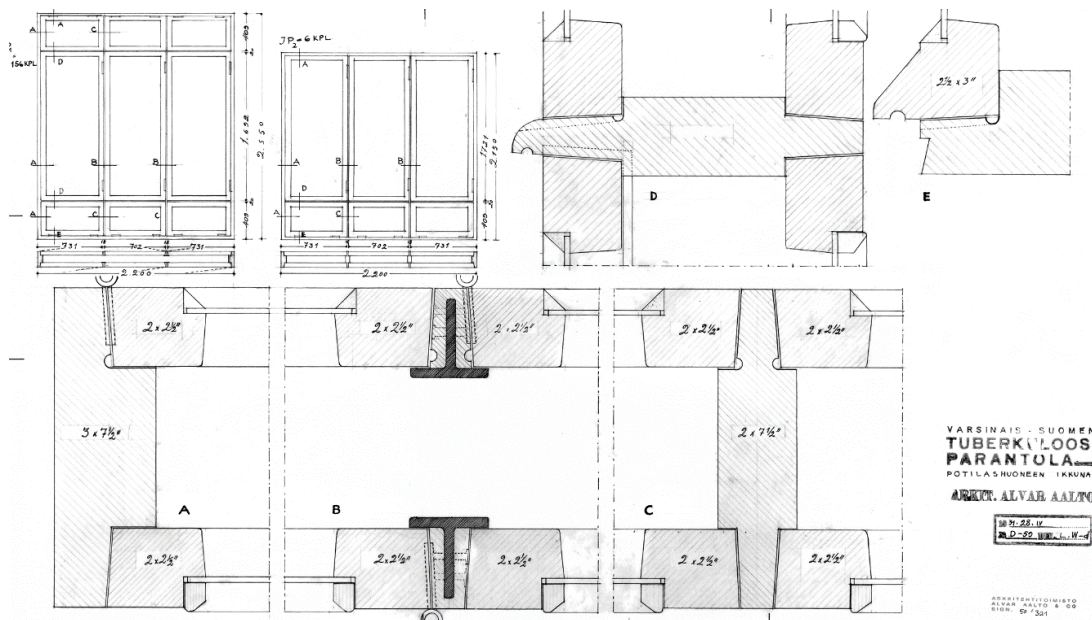


Figure 7. The working drawing shows the realized version of the patient room window. T-profiles supported the two mullions of the middle row of the nine-section window. In the top and bottom rows, the mullion ran through the structure. Drawing No. 50-321. The drawing has been edited. Alvar Aalto Museum. Used by permission.

The medical specialists of the sanatorium project preferred health windows, which architects had used in schools, hospitals, and other public buildings since the mid-19th century. By reiterating this concept and defining his window as a “health window,” Aalto managed to affirm the opinion of medical experts. Aalto’s unusual window design required the use of a few steel components, which entitled him to talk about an innovation and a hybrid. The material hybrid was, for Aalto, a conceptual victory over a traditional wooden window. Inventing a new concept made the solution interesting to the profession of architects. The media was a must-win battle for an architect wanting to position himself as an avant-gardist. The Spanish-American architectural theorist Beatriz Colomina found in her study that the production of architecture shifted from the building site to the immaterial domain of the media (Colomina [1994] 1998, pp. 14–15). The Paimio example showed that Aalto consciously used media to mediate his understanding of architecture.

While the final window was not ideal from the architect’s perspective, it is likely to have been an acceptable compromise. Doctors had requested that the unsymmetrical steel windows not be to reach to floor level for reasons of hygiene. Aalto changed the windows accordingly so that the bottom edge of all window sections was level (Figure 6b). He also changed the shape of the floor so that it curved upwards. Visually, the window reached the floor in the realized version. The solution fulfilled the hygienic standards of the doctors, and the architect could preserve some essential design features. This example is illustrative of how designers work: Aalto reframed the problem and found an unexpected new solution, which combined seemingly different starting points. The case also showed the unpredictability of the evolution of technological solutions—at the beginning of a design project, it is impossible to know the outcome. Besides, without understanding how things came to be, the final artifact, in this case, the window, gives no clues to the process of which they are the result (Figures 6–8). We need to look profoundly to the process to unveil the motives.



Figure 8. The window looked like a traditional double-glazed system, but was materially a hybrid combining wood and metal. Also, the horizontality of the ventilation system was unusual. Photo No. 50-003-360. Alvar Aalto Museum. Used by permission.

2.3. The Integrated Patient Room

When taking a look at the patient room, the overall design comes across as a most harmonious one. One is tempted to think that the Building Board commissioned Aalto for the interior design, including all its parts. However, close reading of the archive material revealed that this is not the case. For example, the client split the furniture purchases into parts with no holistic idea (Table 1). This chapter disclosed Aalto's tactics used to bring about the coherent whole.

The concept of “minimum apartment” inspired Aalto to study the needs of the patients in this hospital project. In line with the Fordian ethos, Aalto was conscious of the role of the users of health care services, the patient-consumers, and placed them in his design focus. Therefore, Aalto's creation was socially more radical than other Finnish hospitals built in the same period. His original solutions created a sense of individuality to enrich the everyday environment in an empathetic manner.

In the small room of two patients, making space-saving design solutions was necessary. Aalto multiplied the available space by design: he used multi-function artifacts such as the bedside lamps, and objects that overlap spatially, such as the bedside table. In short, he approached the small dwelling as a holistic problem. He also created several standard drawings related to the patient room. Again, the harmonious image of the furnished hospital room tells nothing of the process that preceded the result (Figures 8 and 9).

Table 1. Patient room furnishings.

Furniture	Built-in-Furniture Commissioned from the Architect	Loose Furniture Commissioned from the Architect	Loose Furniture Purchased Standard	Chair Purchased Standard	Manufacturer
The wardrobes (Figure 10)			×		Huonekalu- ja rakennustyötehdas ¹
The table (Figure 10.)	×				Huonekalu- ja rakennustyötehdas ¹
The bedside table & cupboards (Figures 9 and 11)			×		Huonekalu- ja rakennustyötehdas ¹
The bed (Figures 9 and 12)			×		August Louhen rautasänkytehdas ¹
The chair (Figure 13)				×	Huonekalu- ja rakennustyötehdas ¹

¹ The two companies, Huonekalu- ja rakennustyötehdas, and August Louhen rautasänkytehdas (The Steel Bed factory of August Louhi), were collaborators among them and with Alvar Aalto already before the Paimio Sanatorium project.

Aalto was responsible for purchasing the furnishings of the hospital. He divided the furniture into four classes in the acquisition programme. Only some of these categories were part of the design remit of Aalto's office. The Building Board's aimed at an appropriate and economic result. In principle, it was not interested in an artistically-coherent whole. In the spirits of the Frankfurt housing schemes, Aalto was keen to realize the patient room, including the tiniest of details.

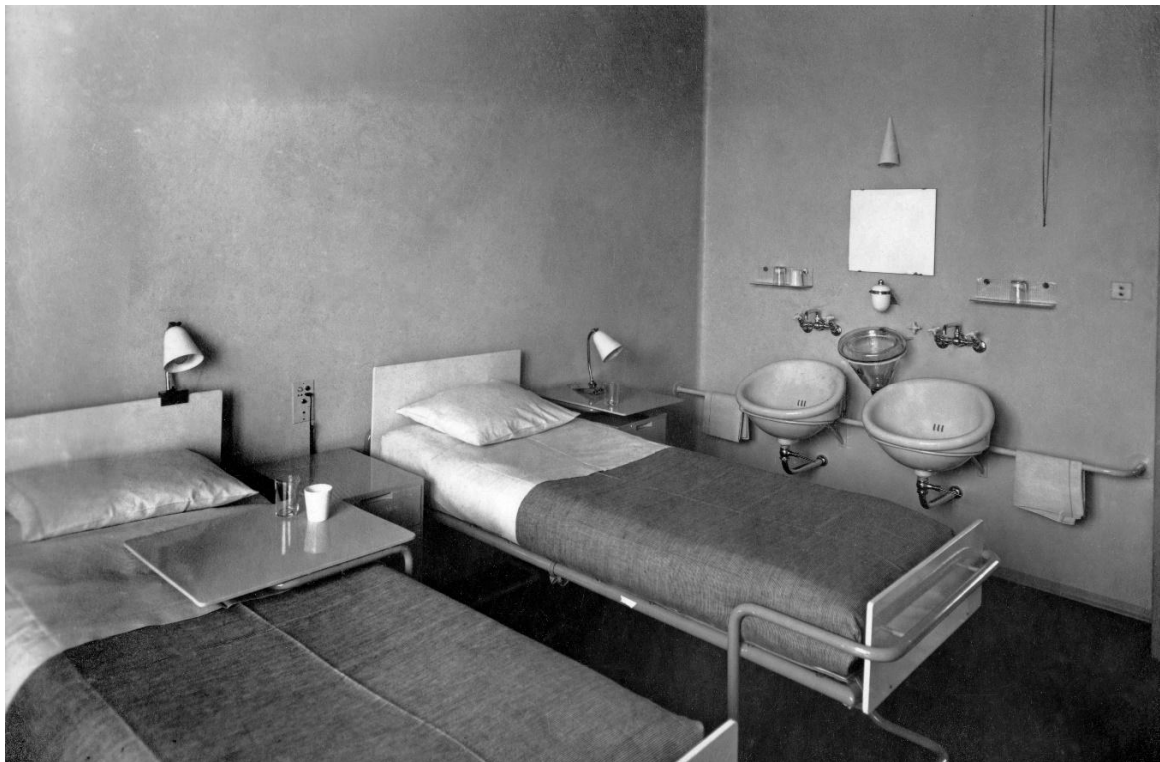


Figure 9. A newly completed patient room is harmonious and holistically designed. Photo No. 50-003-361. Alvar Aalto Museum. Used by permission.



Figure 10. The wardrobe and the fixed table photographed in the museum room of the sanatorium in 2015. Photo Ark-byroo Architects. Used by permission.



Figure 11. The bedside table and cupboard. Photo Ark-byroo Architects. Used by permission.

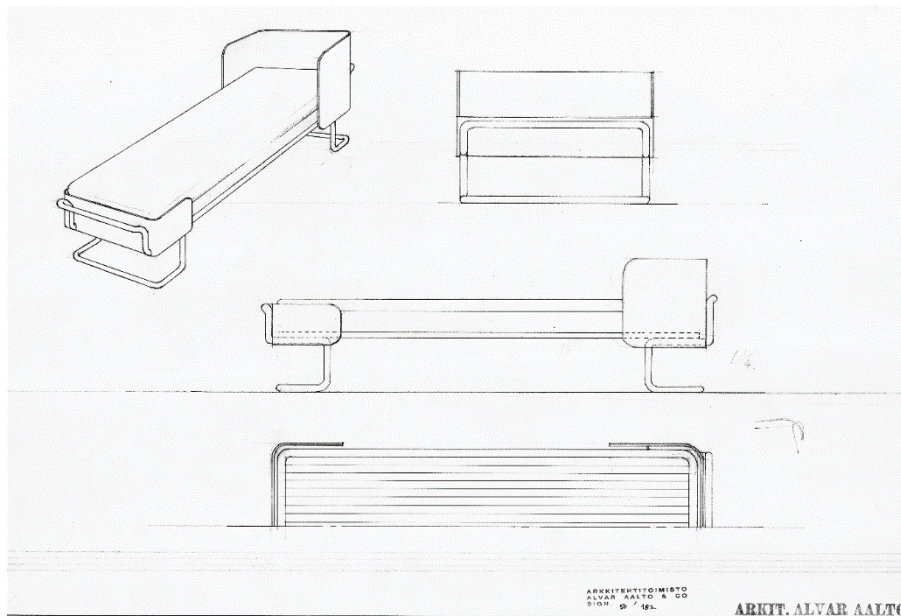


Figure 12. The bed design was more nuanced than the realized version, which is visible in Figure 5 on page 7. Drawing 50-182. Alvar Aalto Museum. Used by permission.

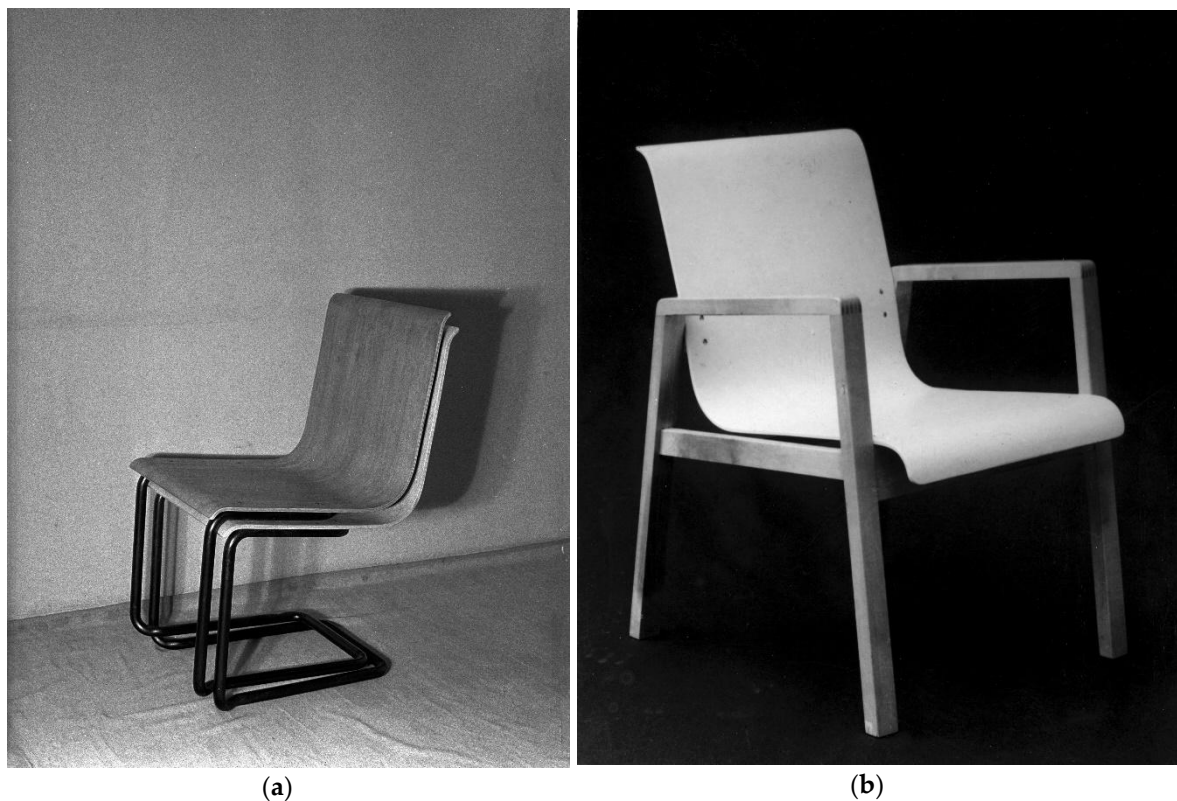


Figure 13. (a) The hybrid chair with steel tube legs and a bent plywood seat is Aalto's design from the late 1920s. Aalto used this Modernist chair with a cantilevered structure in his standard; (b) Photo No. 105890. Alvar Aalto Museum. Used by permission. (b) The small, stackable armchair of the patient room was of wood, which as a local material was cheaper than metal. Photo No. 105931. Alvar Aalto Museum. Used by permission.

Realizing the holistic design required a great deal of effort from the architect from these starting points. By maneuvering the purchasing processes, he was able to support his intentions by always invoking the lowest price from the preferred manufacturers. Aalto knew the rules, and it was his job to invite tenders. In addition to this position and the resources of his architectural office, he also formed part of many local collaborative networks, which had taken shape during previous projects. Therefore, for instance, the manufacture of the model wardrobes for the patient rooms at Huonekaluja Rakennustyötehdas (the Furniture and Building Work Factory) was completed in record time. Aalto showed great creativity in mobilizing his social networks and physical means.

Aalto's underlying strategy was to launch his furniture into serial production—something that previous research had already suggested, and the present study further confirmed (See for example [Standertskjöld 1992a, 1992b](#)). In Paimio, Aalto aimed to use standardized products for hospital purchases, and at the same time to design the very standards. Regulated products by other manufacturers were available, but they did not pass muster with Aalto. His likely motive was to introduce his designs into serial production and get continuous income from manufacturing industries.

2.4. The District Infrastructure

On the timeline, the building design preceded the composition of district systems, including heating, water, sewage and electricity. No engineers with knowledge of these rapidly evolving fields participated in the early, decisive stages of the project. The expertise of the architectural agency and the hospital specialists of the State Medical Board, who played an essential role in the stabilizing of the design solution, was of general nature. As the different ways out of the district systems were not assessed in the early stages of the building project, later no real alternatives existed.

None of the stakeholders demanded that the installation systems be designed concurrently with the architectural design. As a result, the knowledge of different specialists was not at the disposal of the architect until the construction had progressed to execution.

The Building Board had initially requested offers on water, sewage, and heating systems, without a reference plan. The poorly-prepared first contracting round resulted in non-comparable bids and no contract. Instead, the Building Board commissioned a program for the water, sewage, and heating systems from one of the contractors. The second round of tendering was useful as it was based on the plan. However, another company, Plumbing Company Onninen, got the contract. Collaboration between the architect and Radiator, who designed the water, sewage, and heating systems, had been productive (Figure 14). In turn, the poor cooperation between Aalto and Onninen resulted in excess billing about many details, such as the water traps for the washbasins and spittoons in the patient rooms. The architect seemed to have lost his interest in developing this area any further when he needed to work with a partner without mutual understanding. No new ideas emerged, and the focus was on performance only.

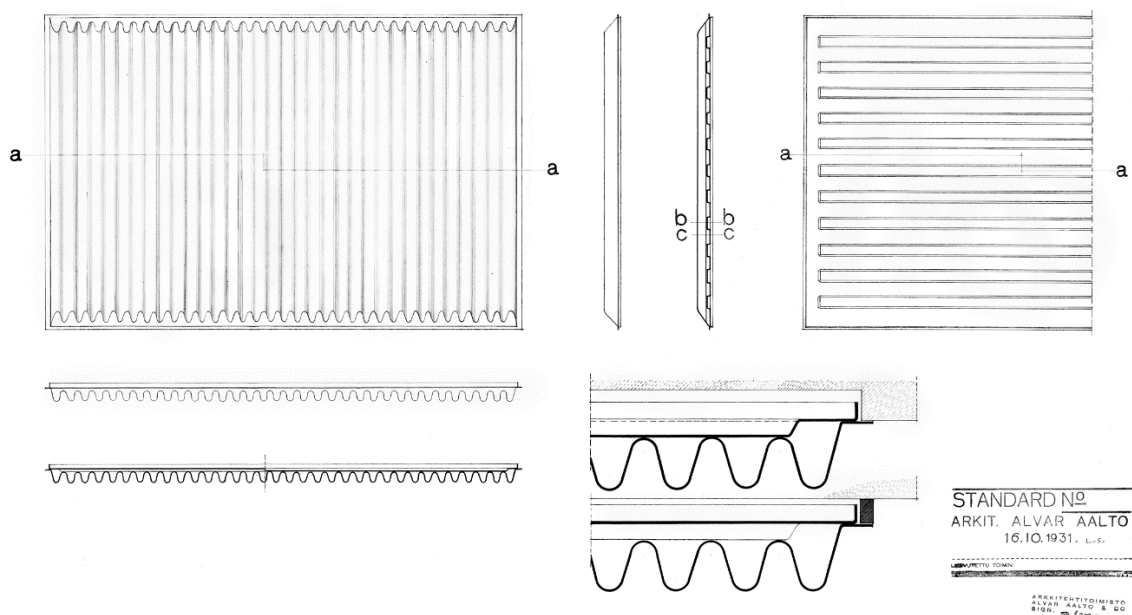


Figure 14. A radiator design by Alvar Aalto proves his interest to look at the technological apparatus and installations more profoundly and to understand the way they function. This radiator design continued the work Aalto had started with the designing contractor Radiator. Drawing 50-202. Alvar Aalto Museum. Used by permission.

Interestingly, the electrical installations, which saw a rapid improvement in the early 1900s, were not of interest to Aalto in this project, except for the light fittings and lifts. However, Aalto was sensitive to the architectural use of light (Norvasuo 2009). Another unusual detail is that the ventilation design quietly emerged as part of the heating plan. Nobody specifically designed it. Although Aalto was aware of the division of Europe into town and country (Aalto 1932b), in the Paimio project, he did not grasp the potential of district systems. Perhaps he had not personally seen any real examples of the architectural treatment of infrastructure systems. The one-year delay of the overall schedule was unfortunately due to the prevailing confusion in the design of the district systems.

It was more natural for Aalto to treat the installation technology—the water, sewage, heating, ventilation, and electrical systems—on the same scale as the patient room, rather than on that of the entire building or district. The resolution of the question of installation systems on the level of the building or the area created difficulties, mainly because the client assumed that the architect would be able to plan the building-level solutions on his own from the very beginning of the design process,

and without input from experts or discussion of the options to hand. In other words, the architect received no specialist support in this area until a later stage of the process. There was no readiness to identify any alternative ways of organising the installation systems until some of the decisions had already been made, thus reducing the remaining options. The installation systems, as distinct systems, were therefore developed for the building, without any architectonic treatment based on mutual interaction, except for a few isolated cases of collaboration.

3. Mobilizing ANT

3.1. Creating Hybrid Networks

As the “captain” of his team, Aalto took an active role in the contracting negotiations of the sanatorium project. He clearly understood the weight of collaboration.

He managed to contract partners that worked well together in the demanding task of erecting the reinforced concrete structure. It was not simple to create the cooperation pattern. Aalto needed to maneuver and stretch the limits of the integrity of the building project to gain his goals. He succeeded in bringing in some of his trusted partners, but as a consequence, he lost some of the Building Board’s trust.

Aalto, with his architectural vision; Henriksson, with his understanding of reinforced concrete structures; Ahti, with his track record as a builder of concrete structures; and reinforced concrete as the material, formed a network that was capable of action. The process was carried out as a joint undertaking by the three specialists, in good spirits and according to schedule, producing an impressive tectonic outcome. The operation succeeded in integrating knowledge of the material into the architectural expression.

A design benefits from inspiring ideas that are tested and subsequently adjusted. The story of Paimio Sanatorium also revealed that the water, sewage, and heating pipe systems, alongside the electrical and ventilation installations, were relatively new to Aalto, and he could not manage their design without input from specialists.

Action, according to ANT, is taken by a hybrid network consisting of both social and material actants. In architecture, an engineer’s knowledge of how a material behaves, and an architect’s understanding of its character, are both essential ingredients in architectural creation. Latour’s abstract thinking embodies the idea of general symmetry, in which the object is an active entity participating in the construct. According to Latour, the effect is not one-directional.

In line with the theme of reciprocity, this study discussed how the current material reality affected the design solution. For example, the Building Board was convinced of the demanding nature of the realization of the reinforced concrete frame and the imperative of a collaborative process, since it went on to select only the fifth-lowest quote. A reinforced concrete building represented new technology, which resulted in more challenging decision-making. However, the Building Board never once questioned the feasibility of the reinforced concrete frame or the final price, which exceeded the budget by 40 percent.

Latour’s view that a project will never amount to anything if its idea remains pure is also fascinating from the perspective of architecture, as it is totally opposite to le Corbusier’s thinking (Colomina [1994] 1998). For Latour, a plan can only materialise if it is exposed to and intermingles with other elements. Only when the resulting artifact becomes unquestionably established, so that this synthesis is forgotten, can an idea be perceived as “pure.” When examining the relationship between architecture and technology, sticking to the sphere of ideas purely would mean forgetting about the collaboration and the materiality.

3.2. On the Locality of Knowledge

The set of Paimio Sanatorium standard drawings can be interpreted through Latour’s theory of the locality of scientific knowledge (Latour 1993). First, Alvar Aalto insisted on including standard

drawings among the working drawings in his design contract. It was somehow necessary for him to establish the concept of the standard to the client, as the idea was, in this context, in all likelihood entirely new for the latter. The architect created many standard drawings in conjunction with the design work for Paimio Sanatorium; a practice that the contract thus legitimised, and which he had already earlier started.

Aalto's intention behind this course of action was to bring an exciting phenomenon, the task of developing a universal solution to a design problem, into his own designer's studio and under his scrutiny. Latour has described Pasteurs' socially successful method in parallel terms. In this way, he, the scientist, could control the circumstances before taking the findings out of the laboratory. In Pasteur's case, it was essential to reproduce the laboratory practices outside the laboratory in favorable, still half-controlled circumstances to show the desired results. In Aalto's case, the next step was to take the designs out from the studio to a trusted producer, not just any manufacturer.

Neither Pasteur or Aalto could know in advance if their invention would work in circumstances they did not fully control. In Aalto's case, entering large-scale industrial production would have been the ideological climax. Latour's thesis of the locality of knowledge and knowledge management seemed to be highly accurate in the Paimio Sanatorium (Latour [1982] 1999, pp. 141–70, especially p. 167).

3.3. *The Hidden Collective*

During the Paimio years, Aalto was in constant interaction with CIAM. He became an ambassador for the international scientific design methodology in Finland. He was, for example, rapid to apply his learnings of the 1929 CIAM conference in Helsinki to an exhibition called "The Dwelling for Minimum Existence" held in 1930. Albeit the Paimio project was socially innovative in many aspects, Aalto's writings were not as radical as, for example, the Czech Karol Teige's, who advocated for a collaborative design method (See for instance Teige 2001; Mumford 2000, p. 53).

Aalto himself first promoted the Paimio project and his other designs in the Finnish professional and daily media, and also in the Nordic press. Aalto and his like-minded colleagues together were successful in defining and stabilizing the meaning of this building in the architectural press. The news considered the sanatorium as something unique in the design of institution buildings, albeit during the construction phase there was no discussion of whether the environment was better for curing patients than other tuberculosis sanatoriums.

Aalto managed to position himself as a specialist of modern architecture. Due to an amplifying snowball effect, he soon became recognised for his work simultaneously both domestically and internationally. Aalto was keen to make sure that the press reported the progress of his hospital project in a favorable light. Aalto became a celebrated figure, while the other participants to the project did not actively appear in the publicity, although Aalto mentioned some of them.

Still, a unique institutional building could only emerge from the interplay between many views and the existing material conditions. The impact of the collective is particularly interesting in the case of a structure that holds a canonised status. When discussing Aalto's buildings, we often fail either to see or to understand the input of other designers and specialists. In a Latourian reading, the collective of the Paimio Sanatorium became visible through its innovator. The significant contributions of the different stakeholders were forgotten. The credit for the success, which was the result of the work by the entire collective, went to Aalto alone. Latour's description of the organisation was well-suited for the case study, as in architecture, the role of the designer is traditionally, and often disturbingly, assigned to a single individual. Anyone familiar with the field will know how necessary it is to view architecture as a collective and an applied undertaking.

3.4. *Translating Meanings*

Michel Callon's concept of translation offered a framework to understand why the architect justified his design solutions differently to different audiences. Aalto's method was simple—he

was smart to differentiate between the relevant target groups. He only needed to understand what motivated each group and to accordingly interpret the same design differently each time.

The design contracts signed between Aalto and the Building Board did not guarantee that the interiors would be furnished with pieces designed by Aino and Alvar Aalto. The Building Board's decision to select the furnishings of the patient room was not aesthetic but pecuniary. Therefore, the artistically-accomplished designer was not successful merely because of his superior sense of the aesthetic, but also for his resourcefulness. For the Building Board of the Paimio Sanatorium project, the ends justified the means, so they gave Aalto considerable latitude to maneuver, which enabled him to bring in, one contract at a time, his old business partners as suppliers to the hospital project.

In the case of the dining hall mezzanine floor, Aalto used drawings for translation. A section proved to the medical experts the benefits of the solution for the treatment, whereas the perspective drawing of the same room showed the architectural articulation.

ANT has been criticized for lacking an understanding of the irrational and symbolic (Vandenbergh 2002). However, architecture is a system of symbolic expression. The study of the Paimio Sanatorium shows that Aalto could achieve his artistic goals by translating the meaning in an appropriate way for each group of stakeholders. Similarly to the study of Marianne Ryghaug, (Ryghaug 2002), this survey also revealed unsuccessful translations, which were as exciting as the successes from the research point of view.

4. Materials and Methods

Latour has urged the researcher to observe the details in light and map out the chain of events. His example directs our attention to what networks reflect of themselves to the outside world. One of the critical issues is to delimit the object of study.

The anthropological approach applied in this inquiry enabled the research object itself to direct the researcher to the salient themes of study. By analyzing Aalto's writings as well as his drawings, the researcher formed an opinion on which aspects of the design were vital for the architect from the perspective of architectural theory. The study also tracked the decision-making processes of the Building Board and identified many topics that it discussed intensely, and that caused conflict. The study followed these points of disconnect, which Latour has dubbed as trials.

From the perspective of the execution of hospital designs, one of the two archives of vital importance was the archive of the hospital itself. The minutes of the Building Committee and the Building Board were records of decision-making during the building process. Aalto's drawings and photographs from the construction period and of the finished building, as well as his correspondence, were kept in the Aalto archive, which was the second of the two principal sources of information. The file also contained certain other documents in addition to those produced by the architects, such as engineers' drawings and product catalogues.

The study compiled a robust description of each building component, or technological system, from the basis of the minutes of the Building Board and the Building Committee, the written contracts, and the inspection records, in chronological order. The researcher looked more profoundly to each building part and compared its narration with other source materials, such as drawings, specifications, and the building itself. The minutes revealed, among other things, the intentions of different parties, and answered questions such as who proposed what, whether someone objected to something, whether the administrative bodies altered the plans, in what way the solutions and decisions evolved, and who was entitled to act as the representative of these bodies in different situations.

Architectural drawings and other design documents were grouped into categories to match the focal points in the study, such as the designs relating to the windows. The categories included drawings from the competition phase to working drawings, and from elevation drawings to the smallest details and standard drawings. The researcher arranged the material in chronological order. This method was useful for understanding the development and its challenges. As the next step, the researcher juxtaposed these considerations against the analysis of the minutes and the workshop drawings.

Through this method, the study traced which building parts the architect afforded the most design effort to, and who participated in the process.

One of the gains of this study was to point out what the controversies of the building period were. Besides, it was in the confrontations which made the stakeholders reveal their intentions explicitly. The research revealed when the architect needed to mobilize his power and the tactics he used. Understanding the controversies helped to construct an idea of the interests of the actants. Following this interaction uncovered the breakpoints between architecture as an expressive and a building as merely a problem-solving system.

5. Conclusions

ANT proved a functional perspective to review architecture in a case study context. An exciting building enabled discussion on the relation between architecture and technology, as it was not necessary to question the architectural quality of the building. This survey focused on the design and construction phase, and especially the agency of the architect. The actors influencing the solutions were both social and material. The material came across the solutions, for example, through the know-how of engineers and the local circumstances. Another equally important potential viewpoint would be to regard the building after its completion when users modify it, and how the structure changes the social practices and experiences of its users.

Architecture as an applied art that combines ethical, ideological, social, economic and material pursuits seems to be a potential ground to mobilize ANT. The ANT lens made it possible to open new perspectives even on a canonised piece of architecture. Now we understand better how these architectural solutions came into being. The agency of the architect did not lead to integration of large technological systems into architecture evenly. Good cooperation was a prerequisite for innovative solutions.

The study clearly showed the importance of a collaborative effort in an architectural project. Latour refers to strong networks formed by social and material actors that together possess the capacity to act. The more in-depth insight into the prerequisites for successful architecture that the study has provided could be useful today. The most famous architectural solutions for Paimio Sanatorium, a demanding institutional building project, came into being in circumstances where the architect managed to create a viable and robust hybrid that merged collective competence with material factors. Creating such a context today could lead to successful innovation of the current environments.

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