The construction industry is a fragmented industry where several actors from different companies consume, process and further develop the common project material. The material forms the basis for the execution of a construction project and is created over the full course of the design. The design process is, however, challenged, partly as a result of the following characteristics:

1. Information storage is primarily document-centric, and BIM tools are mainly used for coordination and production of traditional design documentation in the form of 2D drawings and quantity lists.
2. Data exchanges are handled through the exchange of whole documents rather than specific data.
3. A substantial part of the knowledge built up is only stored in the minds of the project participants who become an indispensable information source over time.
4. It takes several years to carry out a construction project, and over this period of time there is inevitably a replacement of employees.

There are several derived consequences of these characteristics. Information retrieval from static documents is time consuming. It is difficult to establish dynamic links between derived information, and thus it is only possible to reuse work to a limited extent in the next project. Also, inconsistency in the design material is difficult to avoid over time, and it is hard to assess the consequences of a design change. Finally, the success of a project largely depends on the employee replacement and the enclosed loss of knowledge.

The purpose of this thesis is to investigate the possibilities of creating a web-based infrastructure that supports the need for interdisciplinary information exchange in the construction industry. This in a way that allows the distributed project material to grow organically with the construction project and be made available to any authorised actor. This way, insights and traceability are created as the project progresses. The intention is that increased transparency and accessibility of relevant project information will ensure that the design can proceed more smoothly. The overall reference case is the design of building installations.

Semantic web technologies make it possible to conceptually describe knowledge of objects from the real world, and in this project, it is investigated how they can constitute the requested infrastructure. Describing knowledge about an object is achieved partly by classifying it and partly by specifying properties and relationships with other objects. This is accomplished in an unambiguous manner ensuring that the stated knowledge is machine-readable. Thereby, accessibility is increased, and it becomes possible to reuse knowledge and automate the inference of new knowledge. Classes and relationships are described in ontologies that constitute vocabulary and terminology to describe a particular domain. The first contribution to an improved interdisciplinary information exchange using these technologies is a proposal for a minimal ontology, which describes the main topological principles of a building. This enables the description of the spatial and physically tangible components that constitute a building in a general manner, that can be extended with domain-specific terminology as needed. The second contribution is an ontology with terminology to handle complex design properties that change over time, have varying reliability and may be derived from other properties. Together, the two ontologies form the basic framework of the infrastructure that will drive the information exchange.

Through software architectural considerations and implementations, it is demonstrated how a decentralised web-based information exchange can be managed in the construction industry of the future. This is done, for

example, by establishing data sets from BIM tools and IFC and demonstrating how this data set can be expanded through external tools. Furthermore, interaction with the model is investigated in more or less sophisticated ways that align with the workflows that lie in designing a building. Thereby, it is demonstrated what advantages can lie in the industry moving from the current document-centric practice to a more data-centric practice. This is the very core of the semantic web, which is also described as a ``web of data''. Potentially, the technologies can induce a paradigm shift in the design practice of today if they are implemented correctly. This practice is expected to result in buildings with fewer faults and with greater knowledge recycling in future projects. Smooth interaction with the data model is a precondition for the desired paradigm shift to be realised, and further research is needed in this area.