For many years, the use of various wood forms for in place concrete casting has been a general forming way. In the past decades however, wood forming has been challenged by the worldwide restrictions on harvesting. Driven by an increasing environmental awareness, numerous alternatives have been proposed, including steel, PVC and composite materials. The time consuming and thus costly process of assembling, disassembling, cleaning and storing the formwork systems defines yet another demand for future formwork systems: the need of labour saving.

With respect to the above mentioned concerns, many new formwork systems have been developed amongst which Stay In Place (SIP) formwork. After concrete pouring and hardening, this type of formwork system remains in place to contribute to the structural, durable and even esthetical qualities of the concrete element. As Olivier Remy demonstrates with his research, the application field of SIP formwork can be significantly expanded by introducing the newly developed textile reinforced cement composites as a formwork material instead of the traditionally used steel, reinforced concrete or fibre reinforced polymers. Textile reinforced cement composites are promising materials for many future building applications because of their excellent resistance against fire and their good mechanical and durability properties. These promising materials can however not be fully exploited in current building industry by direct translation of existing techniques; new concepts need to be developed.

By going back to the essence of forming techniques and by keeping keywords as lightweight, easiness to place and stand alone systems in mind, this work proposes new concepts for formwork elements. One example of a newly developed concept is a lightweight SIP (LSIP) beam.box formwork, made mainly out of (cement) composite material, which can reach a span of 5 meters without the need of extra supports and which can fully replace the traditional steel reinforcement. In this research, the conceptual design was validated by an experimental program; an analytical model was developed to demonstrate its use in real life applications.

Prior to the birth of the formwork concept, the state of the art in cement composites lacked knowledge regarding inter alia industrial production, properties of cement composite materials themselves and of their interface with freshly casted concrete, and the composite action of concrete cement composite structures. A part of the thesis work therefore addressed and solved these issues, for example by developing and testing an innovative device for the impregnation of fibrous textiles with a cement matrix (Self Compacting Impregnator).

The newly developed concepts and the related theoretical and practical issues that were overcome during this study are situated in a broader context to raise questions and place statements with respect to the use of (cement) composite materials in future building applications.