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Integrated Autonomous Model System as Research Media

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Contextual integration of a **complete research in collaborative virtual space (CVS)** using our new, self-developed, original method.

Strong trend in engineering: **information technology centered contextual integration.**

Engineering requested research has been changed essentially by **cyber physical biological structures (CPBS)**.

Everyday application of **engineering problem related and even fundamental research for multidisciplinary system** development.

Engineering technology was dynamically developed within **modeling software platform (MSP)** products.

Concept, methodology, and realization plan of **Virtual Research Laboratory** (VRL, DSAIAM, ÓU) were developed considering **MSP** capabilities.

Own MSP of VRL was configured in the 3DEXPERIENCE platform (developed, maintained, and operated by the Dassault Systémes S. A.).

Integrated Autonomous **Model System** (IAMS)

IAMS is developed as **organized content in collaborative virtual space** (CVS).

IAMS is a purposeful **experimental model serving research** and represents results in applied informatics and applied mathematics.

IAMS is suitable for **development, validation, and experimental application** of research results.

Pilot project for IAMS will be organized as PhD research at the VRL in the next future.
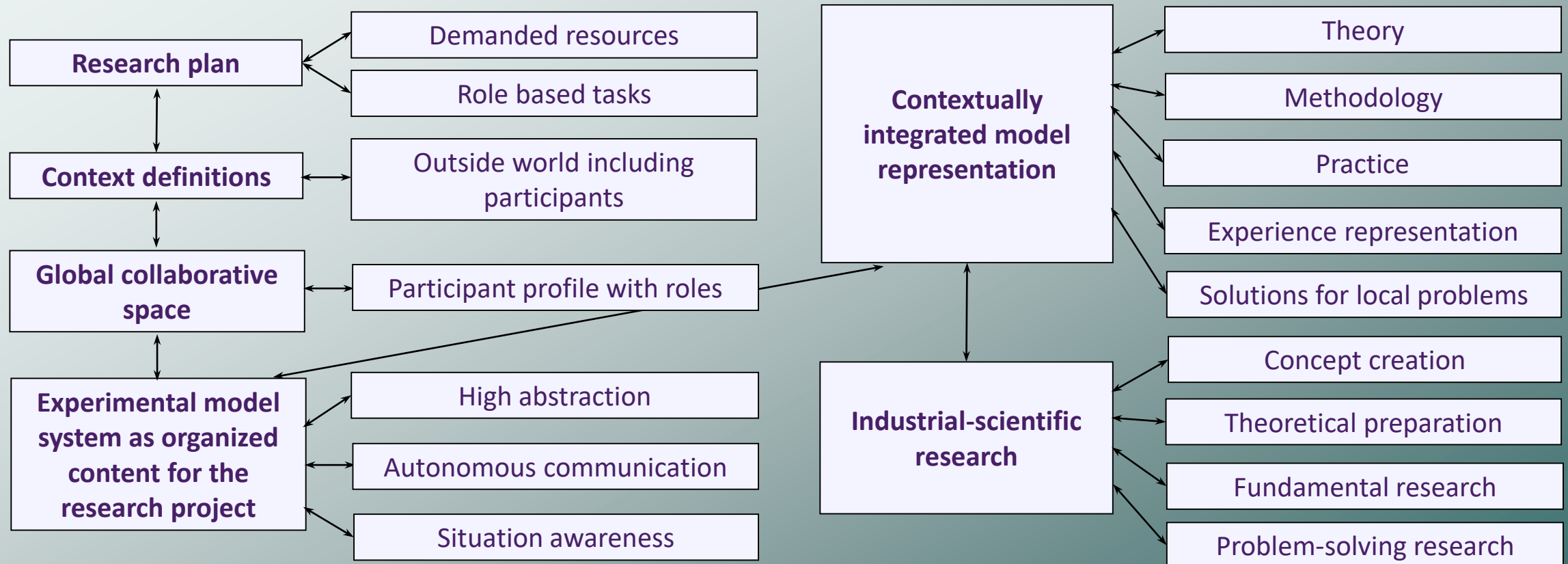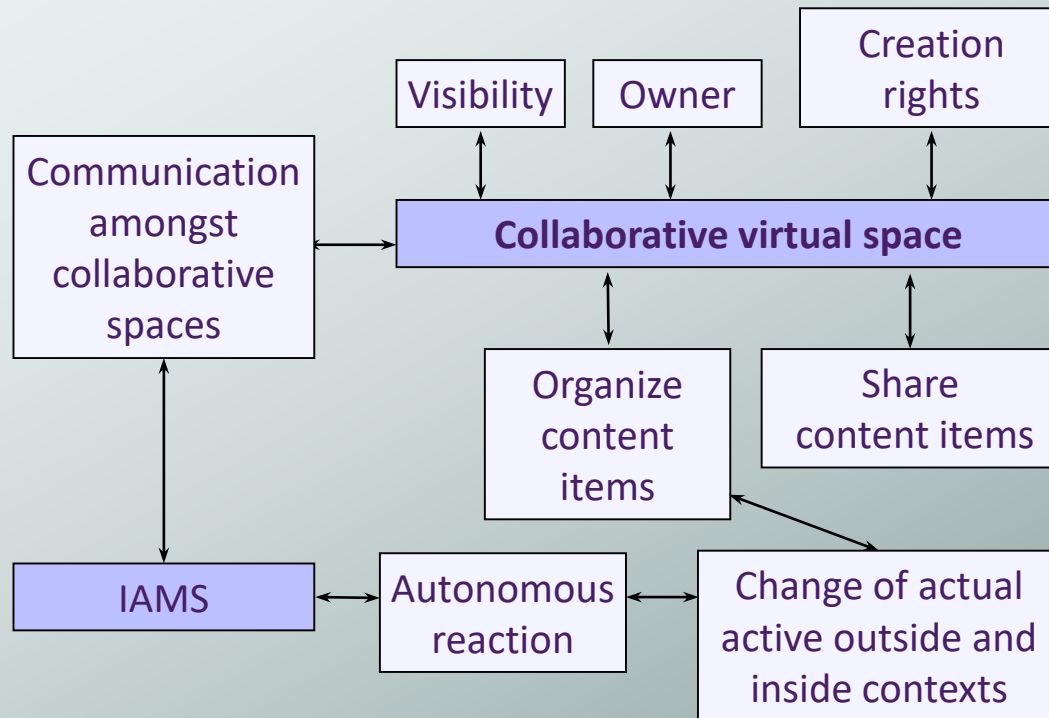
IAMS is the main media for research in a VRL project.

Contextual content items in collaborative virtual space. Autonomous reaction to any change of actual active outside and inside contexts.

Control of research

Company and institution cooperation

CPSB cyber cooperation

Participant intervention

Research plan

Experiment plan

Developing strategy

Research results

System level components

Experimental model control

Physical level components
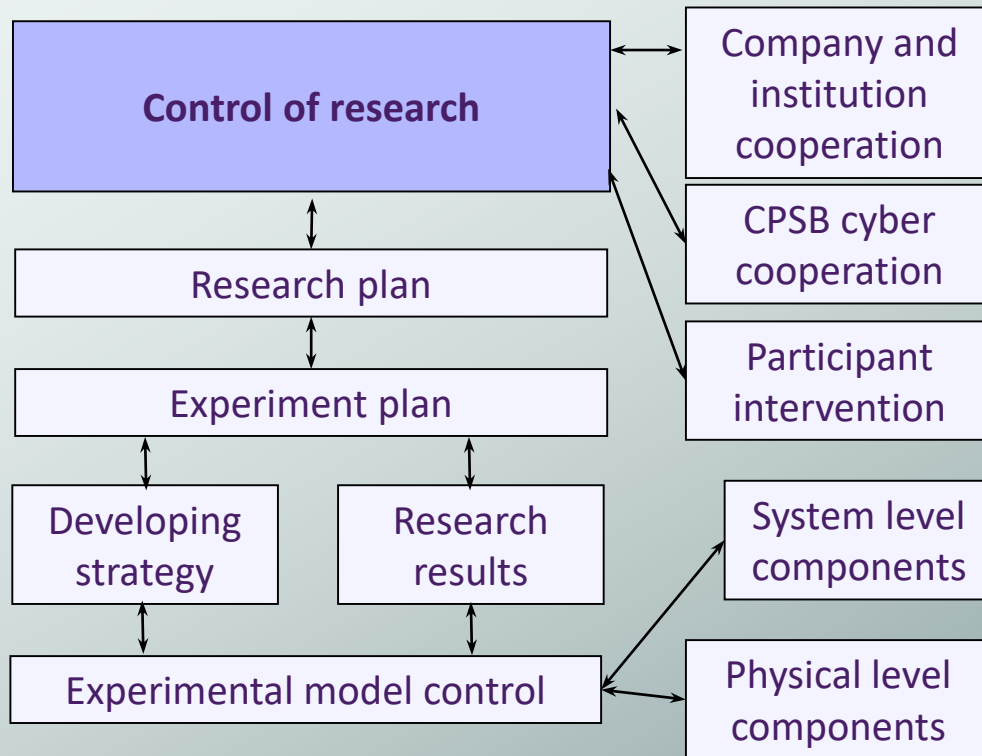
Research is a special application of IAMS.
IAMS was conceptualized to have capabilities to serve a research in its lifecycle.

Platform management by the service provider

Service provider MSP on cloud

Research environment at VRL as own platform from service provider MSP

Local platform management at the VRL

Results from/to solvers outside of MSP

APPS as research tool kits

Collaborative virtual space for industrially oriented fundamental and problem-specific research
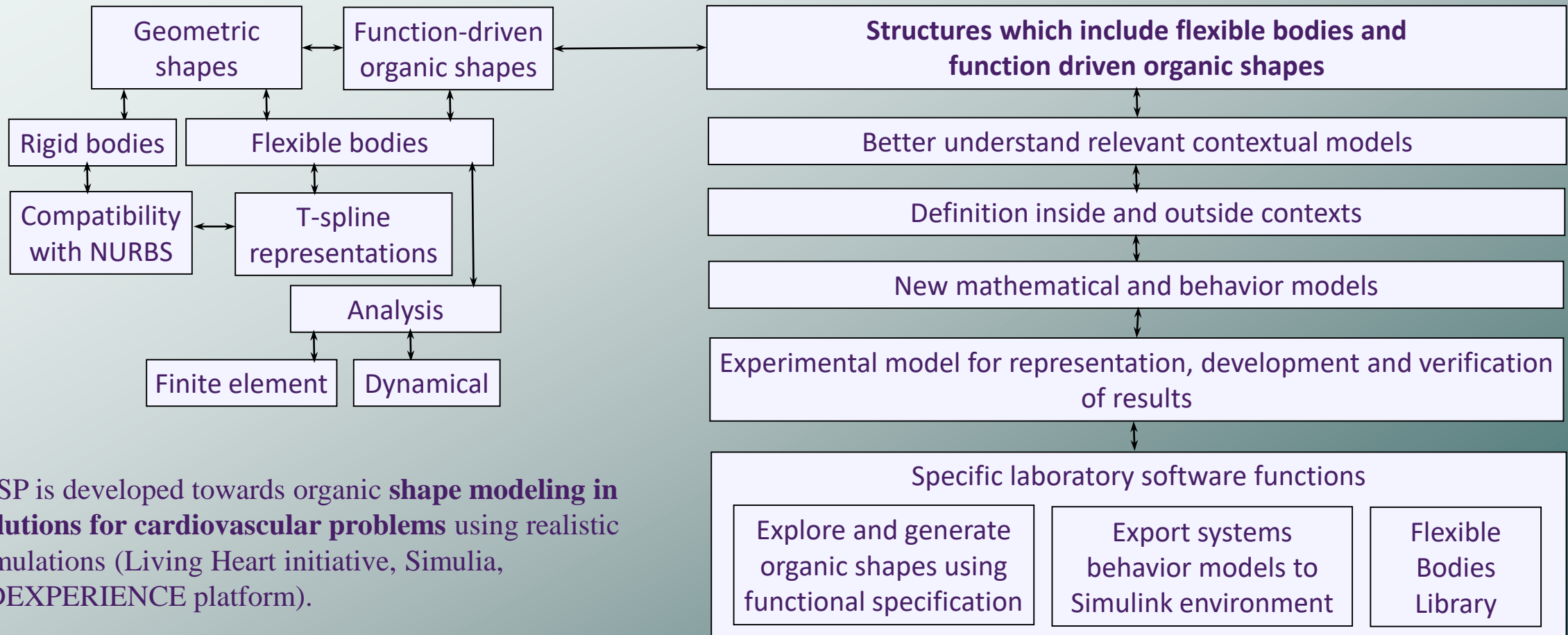
Participants

Roles for each participant

Roles provided and accepted by the platform

Researchers, supervisors, opponents, partners, assistants

Outside of MSP communications

Partners   Programs   Results   Physical   Solvers

Cloud platform enables autonomous, fully contextual, knowledge-based, and reactive **model media communication in CVS**.

Global research projects, with unlimited participation.

VRL initiated PhD student research topic open for PhD applicants.

Geometric shapes ⟷ Function-driven organic shapes ⟷ **Structures which include flexible bodies and function driven organic shapes**

Rigid bodies

Flexible bodies

Compatibility with NURBS ⟷ T-spline representations

Analysis

Finite element

Dynamical

Better understand relevant contextual models

Definition inside and outside contexts

New mathematical and behavior models

Experimental model for representation, development and verification of results

Specific laboratory software functions

Explore and generate organic shapes using functional specification

Export systems behavior models to Simulink environment

Flexible Bodies Library

MSP is developed towards organic **shape modeling in solutions for cardiovascular problems** using realistic simulations (Living Heart initiative, Simulia, 3DEXPERIENCE platform).

Conclusions

The IAMS based VRL is one of the possible answers to integrate fundamental and problem solving related scientific research with research in industrial engineering.

Concept and methodology for engineering modeling platform realized research

Research which can contribute to emerged technology at highly automated industry.