

Towards Designing Enterprises for Evolvability based on Fundamental Engineering Concepts

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Organizations doing business in the 21st century are operating in a hyper-competitive environment in which they are forced to constantly monitor their environment while looking for new business opportunities and striving for customer satisfaction by delivering products and services of unprecedented quality. This phenomenon has resulted in enterprises confronted with new challenges such as ever increasing complexity and increasing change in many or all of their aspects, including their products and services, business processes, business rules and organizational structure. Consequently, current organizations need to be more agile (i.e., evolvable) in keeping up with their swiftly changing business environment.

However, the currently available methodologies for the development of management information systems which are supporting these volatile organizations are clearly unable to deal with these levels of “changing complexity”. Therefore, it is claimed that mastering both the present change and complexity necessitates a more prescriptive and systematic approach regarding the development and governance of an organization and its supporting information systems, based on fundamental engineering principles (frequently coined as “Enterprise Engineering”). Normalized Systems (NS) theory therefore proposes a theoretically grounded framework (based on concepts such as entropy and the systems theoretic notion of stability) that explains why the current modular structures in information systems are intrinsically limited in terms of evolvability and — more importantly — outlines how modular structures can be built without these limitations, thus resulting in information systems exhibiting evolvable modularity

and proven ex-ante blackbox evolvability. Up to this point, the applicability and feasibility of building such evolvable systems at the software level has been proven both in theory and in practice.

The main purpose of this PhD research project is to investigate to which extent the above mentioned theoretical framework of evolvable modularity can be applied onto the business level, such as business processes and enterprise architectures. In doing so, this will allow us to translate information systems requirements (in terms of business processes and enterprise architectures) in a more deterministic way to Normalized Systems. Moreover, it will be aimed for to actually develop normalized business processes and enterprise architectures (“artefacts”, “design patterns” or “domain models”) exhibiting a high and proven amount of evolvability, that way trying to meet the frequently uttered call for higher flexibility within organizations.

Employing a Design Science Research Methodology, multiple case studies will be performed at external organizations during the initial phase of the research. Here, it will be investigated how business processes modeled in BPMN (Business Process Modeling Notation) and enterprise architectures based on DEMO (Design and Engineering Methodology for Organizations) can be translated to Normalized Systems and where the most damaging limitations towards evolvability (so-called “combinatorial effects”) are situated. Based on this, a number of principles will be derived in order to prevent (most of the) combinatorial effects at the business level. Efforts will be made to incorporate these guidelines into other existing methodologies (e.g., BPMN and DEMO). Finally, some normalized artefacts (i.e., business processes and enterprise architectures) will be developed for one or more business domains, enabling the validation and valorization of the obtained research results.

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