

Digital Transformation - Towards flexible human-centric enterprises

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Abstract.

Our society is progressing from an industrial society to a knowledge society and thereby establishing constant changes with unprecedented extent and speed. This is due to the urge of mankind to improve quality of life by gaining knowledge and insights, and to the steadily increased power of information technology.

For enterprises, the changing environment constantly opens new chances and existential risks, which force them to adapt to their changing contexts on time. So, to survive and succeed, enterprises must organize digital transformation as a process to steadily shape their future, and they must consider their context in a wider scope than usual. Also, entrepreneurs are facing increasing challenges.

With these insights, we propose a novel human-centric view on enterprises, their digital transformation, and their position in the society. It combines technical and business levers with enterprise culture. We introduce a reference model-based approach for a continuous, holistic enterprise evolution and focus on the orchestrated solution provider (OSP) as the future enterprise model. It supports the entrepreneur and self-responsible teams to master digital transformation and to sustain the success of their enterprise in the knowledge society.

In this sense, the OSP follows the vision of Industry 5.0 for a sustainable, human-centric and resilient European industry, while going far beyond with its holistic view.

Keywords: Digital Transformation, Human-centric, Knowledge Society, Enterprise Design, Continuous Evolution, Reference Model, Industry 5.0.

1 Introduction

Recent studies show that almost every entrepreneur of any industry agrees on the need of digital transformation for her/his enterprise, of continuous change, and of a scope, which goes beyond technology and includes the human factor, since effective digital transformations require shifts in mindset and behavior [AS20]. Practiced approaches differ and it seems that no one can fully understand the rich set of methods and

practices, which emerge or are ready to support these transformations. It has become best practice and provides some guidance for *digital transformations*, to differentiate the use of digital technology for optimization of existing business models (*digitization*) and for enabling new business models (*digitalization*). Nevertheless, the human factor is often reduced to expectations of customers or motivation of employees.

Instead of adding the human factor to the dominating business and technology views, we place humans in the center of our consideration, and take a broad and holistic view on enterprises and their environment.

This holistic view reveals a fundamental and sustainable change of our society, which implies new business rules. It is the progress from an industrial to a knowledge society which establishes a “new normal” of constant changes with unprecedented extent and speed [CL20]. This is due to two complementary drivers: On the one hand, mankind longing to improve quality of life by gaining knowledge and insights which constantly changes human needs and behaviors. On the other hand, information technology, whose increasing power turns everything into software-defined items, changeable on demand, available everywhere for everyone, at any time.

Knowledge has always been critical. But how it is treated has changed: first slowly over a long period and restricted to privileged people, now boosted by information technology, providing any kind of data, highly available for everyone. But mankind has learnt reality differs from individual perception and there is no absolute truth. Everyone must find own insights for a meaningful life. Hence, knowledge and insights are steadily questioned and individually reflected. Mankind has also learnt the limited ability to grasp reality, which leads to the acceptance of not-knowing and the insight to handle it respectfully. This results in reassessment of risk we impose on our environment and society. Thus, the new type of society is also characterized as risk society [Be92], society of multiple options [Gr94] or reflexive society [BG94].

Consequently, the half-life of acquired knowledge decreases and uncertainty, complexity, and ambiguity increase. This means greater freedom for every individual in shaping her/his own life. Communities of people must establish values and behaviors that provide social cohesion and thereby respect that enterprise cultures are as specific as the personalities and ideas of people building the enterprise teams. Constant search for fulfilment of meaning also converges professional and private world and fosters new solutions for work-life balance [LC20]. The nature of work is also changing. Digital technologies are not only increasing the usability and availability of information, but also the speed of acquisition and change. This turns information into a substantial production factor. Knowledge workers replace industrial workers and ask for novel working models, which resonate with their personal work-life-ideas [Dr94].

These changes hold true on global scale. So, do changing habits from generation to generation. Globally classified as baby boomers, X, Y, Z [Ka20], each generation sets its own priorities, and often takes as granted, what is just gradually accepted from the previous generation (e.g. mobile computing). Enterprises must not only realize the impacts on customer behavior (e.g. sharing instead of owning) or on workplace requirements (e.g. usage of social media), but also on environment conditions.

Summing up, the change to a knowledge society requires enterprises to transform, to leverage new digital business models, and to master disruptive changes. Digital transformations must meet specific requirements:

- Being *flexible* and *adaptive* to seize new opportunities or respond to even unexpected changes in an enterprise or its context. This might raise trade-offs between flexibility and optimality with respect to short-term business goals.
- Being *human-centric* to understand motives and changing behaviors, since humans are drivers and contributors as entrepreneurs and employees within an enterprise or as customers, partners, and non-customers outside an enterprise.
- Being *service-oriented* to meet the individual needs of the customers and to increase customer loyalty. This might comprise products to enable services.
- Being *value-based* to reflect targets and behavior, and to respect the request for meaningful life. This is backed by insights into dependencies between successful business models and the achievement of value propositions. See e.g. the UNESCO sustainable development goals [UN20] and the relevance of Corporate Social Responsibility (CSR) [Po06].

As a solution to these requirements, we present in this article a novel form of the future enterprise, the *Orchestrated Solution Provider (OSP)* as a reference enterprise model and the corresponding *OSP Evolution Method (OSP-EM)*. In this sense, the OSP follows the vision of Industry 5.0 for a sustainable, human-centric and resilient European industry, while going far beyond with its holistic view [EC21].

An OSP is a flexible, human-centric enterprise. It acts on a solid value base towards a meaningful purpose and complies with a reference set of *Critical Success Factors (CSFs)*, which address the characteristics of the knowledge society, the chances it offers and the risks it imposes. In OSP, the *entrepreneur* has a strengthened, but changed role from commander and controller to moderator and motivator, setting guidelines and providing conditions for the *enterprise teams*. They steadily reflect own targets and behavior and act in far-reaching self-organization. Processes are executed iteratively. Structures are built from loosely coupled elements to establish the *flexibility* required.

The OSP evolution method OSP-EM is holistic, since it respects any tangible and intangible aspect, which is relevant for the evolution of an enterprise. Thus, OSP-EM also covers digital transformation and enhances this towards continuous evolution. OSP-EM follows a *reference model-based evolution approach*, which integrates all concepts used into a consistent solution, to document, analyze, and simulate impacts, to allow stepwise introduction into an enterprise, to utilize latest technological developments. It supports the enterprise team in managing complexity and enables sustainable success. Like map and compass, OSP-EM navigates the entrepreneur and the team on their digital transformation journey, and spots areas of activities.

This introduction is followed by 4 sections. Section 2, *Foundations and Related Work*, introduces and explains the main notions used in this article and relates them to existing approaches. Section 3, *Constituents of the OSP Evolution Method*, introduces the taxonomy used to build OSP models. Section 4, *Reference Model-based Evolution of OSP*, proposes and explains the orchestrated solution provider as the new type of enterprise and OSP-EM for its continuous evolution. Section 4, *Digital Transformation of Enterprises*, describes how to realize a digital transformation by introducing OSP-

EM into an existing enterprise. Section 5, *Conclusions and Future Perspectives*, finalizes this article and gives an outlook on future work.

2 Foundations and Related Work

This section introduces the main notions regarding orchestration, an enterprise as such, enterprise design, and its digital transformation, since these notions build the foundation for the solution presented in the subsequent sections of this article. The definitions given reflect our human-centric perspective on enterprises and their context. The second subsection positions the introduced notions in the context of related work as well as within our approach.

2.1 Notions

Orchestration

The notion of orchestration refers to the abstract capability of an enterprise to flexibly compose its products and services as well as the way they are produced and provided according to changing business opportunities and threats. The capability addresses the time needed from the first trigger to the availability of the new solution, the degree of novelty over the existing solution and its complexity (number of elements involved).

Enterprise

An enterprise is an open social system [Lu95]. It consists of people, who agree to collaborate, based on defined rules, under the mutual influence of the context, towards a defined purpose. An enterprise has an enterprise life cycle and a related lifetime. The enterprise life starts with an entrepreneur's idea and continues over its foundation until its termination. It goes through several enterprise life phases.

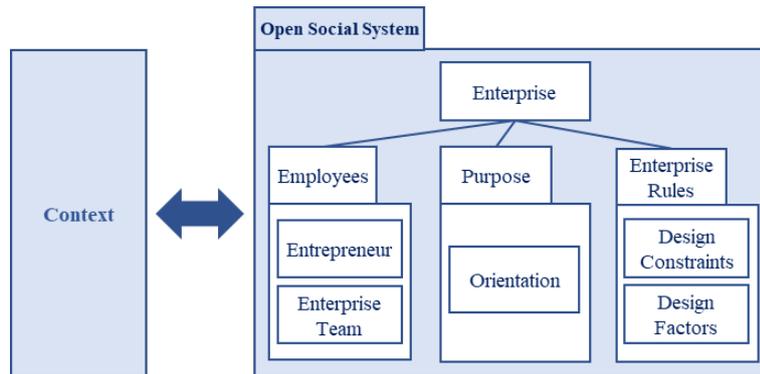


Fig. 2.1 Main notions of our enterprise understanding

The *enterprise team* are the people (*employees*) the enterprise consists of, with membership clearly defined by their agreement to the rules of their collaboration, i.e. contract of employment. Depending on her/his role, the *entrepreneur* can also be a member of the enterprise team. *Purpose* refers to the general reason, why the enterprise exists, at all. It gives the enterprise team quite a stable *orientation* during the enterprise life cycle („north star“). The *enterprise rules* of an enterprise consist of agreed *design constraints* and *design factors*. Fig. 2.1 gives an overview of our enterprise understanding.

This definition of an enterprise covers organizations of all kind, commercial companies in any industry or any legal construct as well as non-commercial institutions or organizations (government, non-profit, e.g.), of any size (small, medium, large) and at any phase of its existence (start-up, established, e.g.).

Enterprise design

Each enterprise has a specific enterprise design. It characterizes the evolving collaboration of the enterprise team holistically through its culture, strategy, and structure.

There is various evidence from industry and science perspective that culture must be taken seriously and that culture, strategy, and structure are mutually dependent and should be evolved comprehensively [HB07, HH17] (cf. Fig. 2.2).

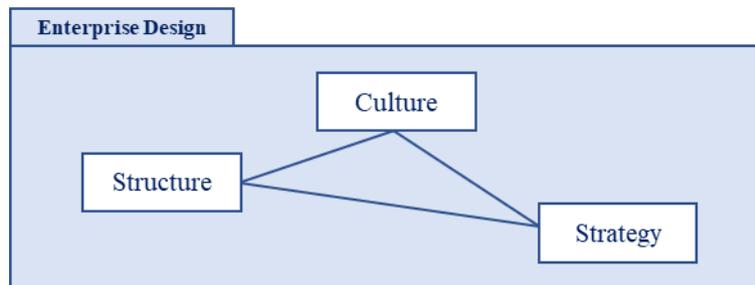


Fig. 2.2.: Elements of an Enterprise Design

Here, the *enterprise culture* are the *intangible* rules how the enterprise team shapes their collaboration, i.e. values, norms, expectations, and the respective evolution. The *enterprise structure* are the *tangible* rules how the enterprise team shapes their collaboration, i.e. processes, responsibilities and roles, and the respective evolution. The *enterprise strategy* is the approach of how the enterprise team pursuits the enterprise purpose, i.e. goals, benefit creation model, and the comprehensive evolution of the collaboration rules and the benefit creation model. The enterprise strategy contains both tangible and intangible elements.

The enterprise culture is called *reflexive*, if the enterprise team constantly reflects their strategy (“Are we doing the right things?”), their structure (“Are we acting in the best possible way?”), and their culture (“Are we obeying what is important to us?”) against changing context conditions and if they draw conclusions out of it.

The enterprise design has design *states*, which are defined by the combined states of its design factors culture, strategy, and structure.

An enterprise design state is *related* to a certain point in time (past, current, future), and to a defined subject (e.g., the enterprise life cycle or a dedicated scenario to resist certain impacts from the context of the enterprise). The design state is called

- *solid*, if opportunities and threats (*risk profile*) are under full control of the management, i.e. analyzed, evaluated and measures defined,
- *flexible*, if any actual design state can be changed within a given time into a new solid state which meets changing context conditions,
- *harmonized*, if the states of the design factors culture, strategy, and structure are synchronized with respect to their mutual dependencies.
- *unharmonized*, if the design states of at least two design factors are not synchronized (e.g. when developed isolated).
- *digitized*, if the business model of the enterprise is improved by using digital technology (e.g. increased profitability by process automation),
- *digitalized*, if the business model of the enterprise is enabled by using digital technology (e.g. digital sales channel by internet portal technology).

The *enterprise operation* is the execution of enterprise activities according to an enterprise design state given. The *maturity* of an enterprise design state expresses to which degree the design state enables enterprise operations to fulfill a defined set of enterprise constraints and rules.

An enterprise design can be described by an *enterprise model* [Gi10]. Such an enterprise model might conform to an *enterprise reference model* where enterprise constraints are predetermined.

Enterprise evolution

Enterprise evolution is any sequence of enterprise design states which are related to the same enterprise life cycle (cf. Fig. 2.3).

Enterprise transformation is any managed transition from a starting design state to a target design state. The transition may comprise multiple *transformation steps*. A *transformation roadmap* is a description of any planned sequence of transformation steps. Any transformation state can be characterized by the state of the enterprise design and its maturity.

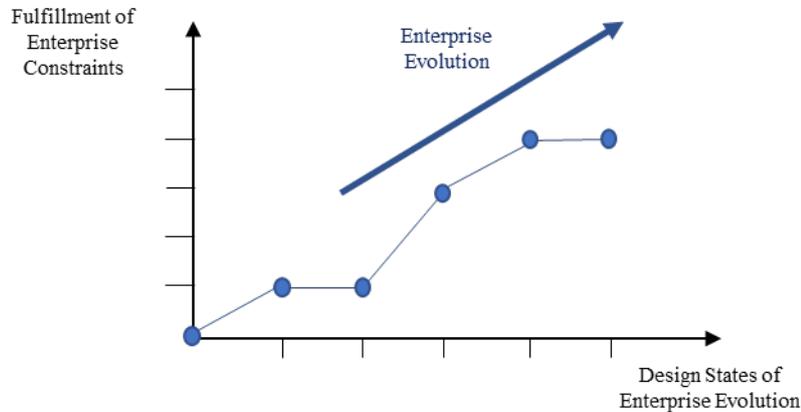


Fig. 2.3: Enterprise Evolution

An enterprise evolution is called

- *holistic*, if each state of the evolution is harmonized. An enterprise transformation is called holistic, if the target design state is harmonized.
- *continuous*, if a transformation process is established which at any point in time transforms a given design state into a subsequent design state.
- *enterprise model-based*, if an enterprise model is used to describe the states of the enterprise design within the evolution and to describe the respective transformation measures taken.

Digital Transformation

An enterprise design is called *digital* if it is based on a digitalized design stage. The digital maturity of an enterprise design expresses to which degree it enables the enterprise operations to fulfill its digitalized business model. An enterprise transformation roadmap is called a *digital transformation* if it increases the digital maturity of the enterprise design state it starts with. An enterprise design state is called *digital ready* if the enterprise has defined a digital transformation to establish a digital design state.

2.2 Related Work

Designing an enterprise has been studied from different viewpoints within several scientific disciplines. Informatics and Business Informatics have investigated Architectural Frameworks which range from a business over an IT application landscape towards an execution platform perspective. As enterprises are economic units, Economics has studied e.g. business strategies, models and processes, organizational structures, enterprise evolution and change processes. As enterprises employ people, psychological issues have been studied in Economics and Work Psychology. As enterprises operate in a society, sociological results like social systems theory are important.

Architectural frameworks have gained in importance as they allow to integrate into one framework business as well as information technology aspects. This enables to handle the interdependencies between business goals and constraints on one side with software solutions and underlying technology infrastructures on the other side. Well-known examples are The Open Group Architectural Framework TOGAF [OG20a], the Integrated Architectural Framework (IAF) [VW10], the Generalized Enterprise Reference Architecture and Methodology (GERAM) [BN14], or the OASIS Reference Model for Service Oriented Architecture (SOA-RM) [OA06].

Some of these architectural frameworks come with a corresponding architecture development method, as e.g. the TOGAF *Architecture Development Method* (ADM) or *Quasar Enterprise* for IAF [EH08]. They give concrete guidelines how to develop an IT architecture that meets the needs of an enterprise. Also, the ArchiMate® Enterprise Architecture Modeling Language, a standard of The Open Group, has to be mentioned here [OG20b]. It supports to describe the construction and operation of business processes, organizational structures, information flows, IT systems, and technical infrastructures. The resulting models help stakeholders to design, assess, and communicate the consequences of decisions and changes within and between business domains.

All these frameworks and modeling languages take a quite technical view on relations of business activities and information technology. This is also the case in recent research results on agile developments of software ecosystems, where software and business aspects can be adapted on-the-fly during system enactment [ZG15].

Our approach on developing future enterprises is on a higher abstraction level, and thus less detailed than these model-based approaches. We take a holistic, reference model-based view and consider culture and strategy aspects equal to business and technical aspects. We deploy a three-layered approach as known from traditional database schemes, which distinguish the three levels termed conceptual, logical, and physical data base scheme [AN75]. This distinction has also been reused by the OMG (Object Management Group) within their Model Driven Architecture® (MDA®) approach which differentiates the Computation-Independent Model (CIM), the Platform-Independent Model (PIM), and the Platform-Specific Model (PSM). They are stepwise refined in a system development process [OMG20].

We will reuse such a three-layered refinement approach to refine high-level enterprise models into our novel *Orchestrated Solution Provider (OSP)* reference enterprise model. This reference model can then be used to design a concrete enterprise model by deploying the corresponding OSP evolution method OSP-EM.

There is nowadays a common agreement that any kind of development and evolution process should be done in an iterative and agile way. Our approach, too, is based on basic principles of the Agile Manifesto [Ma01] like

- close cooperation between all involved stakeholders,
- openness to any kind of changing requirements and context influences,
- self-reflexive and self-organized team structures and
- cultural values like highly motivated individuals and trusted relationships.

A management-oriented approach to enterprise development and evolution has been developed since several decades at University St. Gallen. The current St. Gallen Management Model (SGMM) [RG20] has a systemic and entrepreneurial orientation and differentiates management into operational, strategic and normative aspects. At the

same time, it emphasizes that management and organization are in a dynamic interaction with the context and that management is a reflective design practice. While there are a number of similarities with our approach, we aim at concepts dedicated to a digital transformation, give culture, structure, and strategy equal relevance and thus do not focus on management issues.

The SGMM and our approach have in common that we follow Luhmann’s system theory [Lu95]. He claims that a system in principle distinguishes itself from its environment. So, there is always something that belongs to the system and something that does not (environment). Other systems also belong to the environment. This difference system/environment is the basis of the whole system theory by Luhmann.

There is a series of recent work on enterprise design from a scientific as well as from industrial experience point of view each focusing on certain aspects. Thus, they are less holistic in their approach as we are but influenced our work. Some examples are

- the “Design of enterprise systems” approach by Giachetti [Gi10], who proposes a quite concrete engineering process, where a dedicated enterprise engineer guides all aspects of an enterprise development process,
- the “Enterprise Architecture as Strategy” approach by Ross et al., who shows how constructing the right enterprise architecture enhances profitability and time to market, and improves strategy execution [RW06] or
- the investigations by Alwadain et al., who identified the factors which influence an enterprise architecture evolution [AA15].

In most of these technology- or economics-driven approaches, culture and human aspect are underrepresented. Due to the discussion on new working formats in enterprises, these aspects are gaining a higher relevance. In agile and lean process approaches, e.g., all kind of stakeholders are handled as first-class entities. Another example is the increasing care about workers’ welfare, which is strongly influenced by Seligman’s Positive Psychology [Se02]. This, and recent discussions on changes in work-life-balance as well as the “new normal” of future work underline that culture and human-centricity have grown to equal importance with pure strategic or organizational issues. This is reflected by our holistic approach to enterprise design and evolution.

3 Reference Model-based Evolution of OSP

This section introduces our three-layered enterprise evolution approach. Based on an underlying taxonomy, we will introduce concepts and constituents of a conceptual enterprise model, our reference enterprise model OSP as well as the specifics of a concrete enterprise model

The OSP enterprise reference model enables a comprehensive and continuous evolution of all tangible and intangible elements of an enterprise and their interdependencies within the enterprise and with its context. It supports managing the complexity, which is driven by the vast number of relevant elements and their changing interdependencies. Furthermore, the evolution increases the flexibility of the enterprise to a level, where it is able to conduct fundamental and far-reaching changes with increasing speed after relevant events or insights have occurred.

The corresponding OSP evolution method OSP-EM meets these requirements by separating three concerns:

1. the evolution of a value-based targeted enterprise with people at its core,
2. the flexible evolution of an enterprise, which respects concern 1 and meets the special conditions of the knowledge society,
3. the evolution of a concrete, existing enterprise, which respects concern 2 and the special situation of a real enterprise.

Each of these concerns is covered by a dedicated three-layered *enterprise evolution approach*: (1) the *conceptual enterprise model*, (2) the *reference enterprise model* (OSP model), and (3) the *concrete enterprise model* (cf. Fig. 3.1). Each of them is introduced in detail in the subsequent subsections.

All of them rely on the same taxonomy and build upon each other by well-defined refinements and supplements. Refinements and supplements are methods for enterprise evolution and artifacts for the description of relevant facts. This supports sustainability by adaptability to latest methods, technologies, and specific knowledge as needed, while the constraints given by the taxonomy ensure effective integration. The enterprise model-based approach supports to document, analyze, and simulate impacts [CK20]. But the restriction remains that a model-based approach only approximates the real world and focuses on aspects relevant for the evolution of a concrete enterprise [St73].

Subsequently, we describe the taxonomy and each enterprise model in detail.

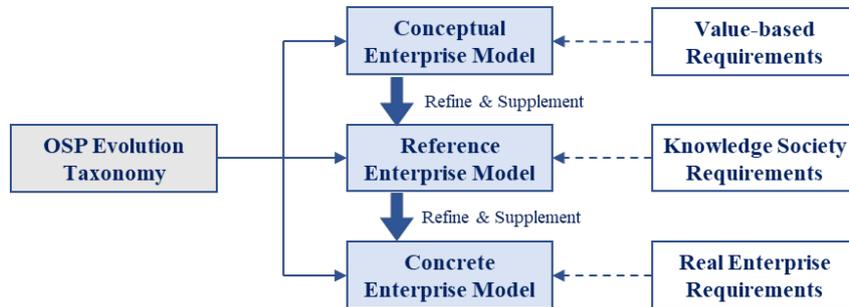


Fig. 3.1: Three-layered structure of enterprise evolution models

3.1 OSP Evolution taxonomy

The OSP evolution taxonomy as the base for our three-layered enterprise evolution approach integrates the concept of an enterprise as an open social system (cf. Section 2.1) and a fundamental scheme of human interaction comprehensively into a network of impacts on humans and their behavior. It is given by a *structural view* as well as a *dependency view* on this network (cf. Fig. 3.2).

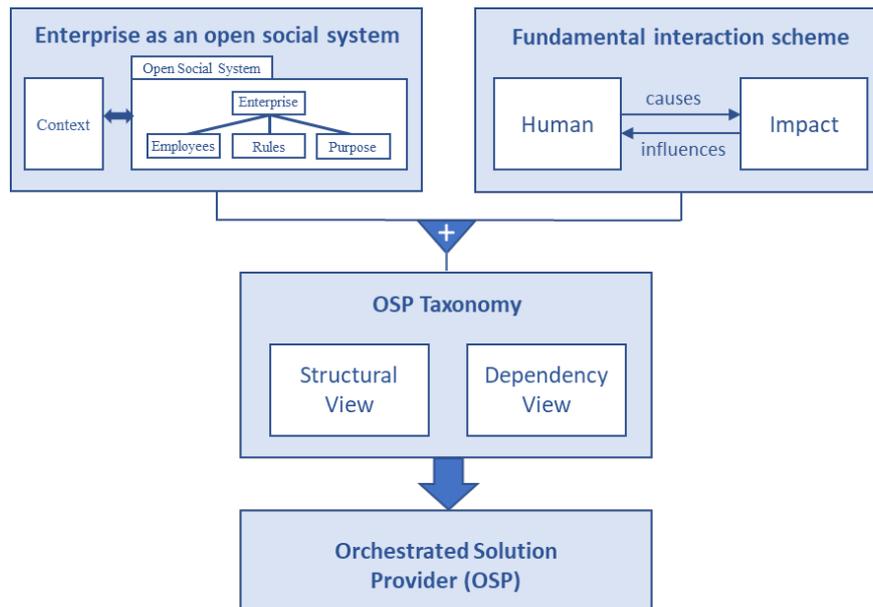


Fig. 3.2: Views of OSP Evolution Taxonomy

The interaction scheme represents human behavior causing impacts, which then influence human behavior again. *Personas* group human behavior according to roles humans take. *Impact factors* categorize impacts depending on the related roles and the kind of influence. This scheme provides a general description for all aspects of enterprise evolution within the enterprise and its interdependencies with its context. The structural view is given by an *information model*, the dependency view by a *dependency matrix*. Our new reference enterprise model, the Orchestrated Solution Provider (OSP), is derived from this network of impacts.

Structural View of OSP taxonomy

The structural view (cf. Fig. 3.3) defines the environment of an enterprise as the *social system*, consisting of the *society* all humans belong to. Their *behavior* as the *context* is in mutual influence with the enterprise. *Personas* and *impact factors* provide a seamless integration of the enterprise and the society. *Personas* consistently describe the roles people have in the society and the enterprise. They are differentiated into those, who have an external role related to the enterprise (like customers, partners, competitors), and those which build the enterprise team and are enterprise employees. Depending on her/his role, the *entrepreneur* is external and can also be an employee of the enterprise.

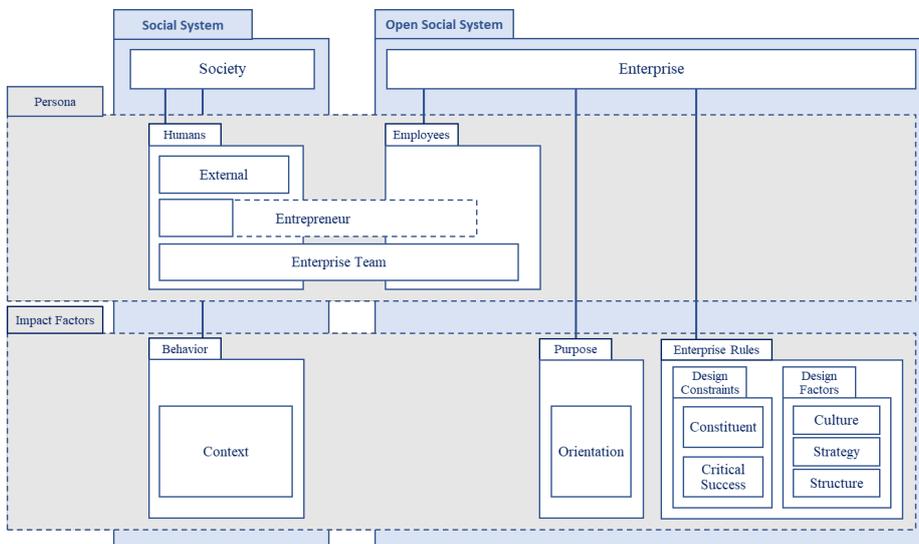


Fig. 3.3: Structural View of OSP taxonomy

Impact factors are the *behavior* of humans in the society, the *purpose* of the enterprise, and the *enterprise rules*. The *context factors* describe which opportunities and risks arise for the enterprise (trends) through the behavior of humans in the society. The *orientation factor* motivates the general direction the enterprise takes. *Constituent factors* and *Critical Success Factors* (CSFs) define the constraints for enterprise design. The *constituent factors* define the starting point for the enterprise design and the allowed corridor for their evolution. The CSFs define the conditions the enterprise design must meet under the given or developing context factors to enable fulfillment of the enterprise's purpose. Since culture, strategy, and structure comprehensively describe the enterprise design, determine the collaboration of the enterprise team and the evolution of the enterprise, they are called the *design factors* of the enterprise.

Dependency View of OSP Taxonomy

Dependencies are between personas and impact factors, and between impact factors.

The external humans change the context factors. In this regard, e.g. the buying behavior of customers is also abstracted to context factors. The entrepreneur sets the constituent factors and decides on the level of their details. The enterprise team reflects and develops the design factors and enacts them in its daily operations.

The context factors influence the behavior of the external humans and define requirements to the constituent factors, the design factors, and the CSFs by providing opportunities and threads. The constituent factor defines the orientation factor, and the starting point for an enterprise design as well as the allowed corridor for its evolution. The design factors guide the behavior of the enterprise team towards the orientation factor according to the CSFs. They define further evolution of the orientation factor and the CSFs. The orientation factor promises benefits to the external humans (cf. Tab. 3.1).

| | | Personas | | | Impact Factors | | | | |
|-------------------|---------------------|----------|-------------------|--------------------|----------------|------------------|---------------------|-------------------|------------------|
| | → affects | External | Entre- preneur | Enterprise Team | Context | Consti- tuent | Critical Success | Design Factors | Orien- tation |
| Personas | External | | | | → | | | | |
| | Entre- preneur | | | | | → | | | |
| | Enterprise Team | | | | | | | → | |
| Impact Factors | Context | → | | | | → | → | → | |
| | Constituent | | | | | | | → | → |
| | Critical Success | | | | | | | → | |
| | Design Factors | | | → | | | → | | → |
| | Orientation | → | | | | | | | |

Tab. 3.1: Dependencies between notions of the OSP Taxonomy

3.2 Conceptual Enterprise Model

The *conceptual enterprise model* represents the first of the three model layers (cf. Fig. 3.1). It describes the fundamental rules according to which a value-based targeted enterprise with people at its core operates and how it is transformed, without considering special requirements from the knowledge society. In the conceptual enterprise model, e.g. CSFs and the role of values as such are introduced, and the strategic management process is introduced through its tasks and outcomes without paying any attention to flexible execution. The conceptual enterprise model consists of the building blocks personas and impact factors (context, constituent, critical success, design, orientation), as introduced in the OSP-EM taxonomy (cf. Fig. 3.3).

Personas

Personas structure the information which group (*segment*) of people has which influence on the course of the enterprise and how does it change over time. How do they behave? What is their expectation and perception of the enterprise? Which data provides insight and allows which degree of prediction? External people, entrepreneur, enterprise team are basic segments. Additional subsegments of external people are e. g. those with direct impact on the enterprise (like customers or suppliers), and those with indirect impact (like various social groups without any touchpoint with the enterprise).

Impact Factors

Context Factors. The *context factors* handle opportunities and risks from outside the enterprise. They are evaluated for their relevance to the enterprise within the strategy management process. The enterprise defines how to capture the information and which methods to apply for its evaluation. The context factors are aligned with the segmentation of the external people. For those without direct touchpoints with the enterprise, PESTEL (political, economic, socio-cultural, technological, ecological) e.g. provides a general structure, which can be further expanded by special research methods and trend analyses [Ag92]. For customers, insights into buying behavior and experience, product and service perception, loyalty, and willingness to pay are relevant criteria.

Orientation Factor. The *orientation factor* motivates the reason why the enterprise does exist and provide guidance for the definition of enterprise goals and transformation initiatives.

Constituent Factors. The *constituent factors* describe the guidelines the entrepreneur sets for the enterprise team to fulfill her/his business idea; they are considered quite stable and can only be changed in agreement with the entrepreneur. They typically comprise

- the purpose as general orientation,
- the value base on which the enterprise operates as guidelines, which behavior is right (expected) or wrong (not tolerated) and what to prioritize,
- goals the enterprise shall achieve while pursuing its purpose,
- general conditions to be met (e.g. finances, risk profile, governance model),
- the role of the entrepreneur and her/his influence on the enterprise,
- the participation in decision making and the degree of profit-sharing.

Critical Success Factors. The *Critical Success Factors (CSFs)* are initially derived from the constituent and context factors at the foundation of the enterprise. They are related to the business model and updated with insights from the strategy management process. Measurable criteria are set for each success factor, to evaluate the degree an enterprise fulfills its CSFs and to balance and control evolution measures.

Design Factors. The *design factors culture, strategy, and structure* are initially derived from the context, constituent, and critical success factors. They are updated with insights from the strategy management process and synchronized towards the purpose pursuit. Measures to evolve the design factors must respect their specific nature. The enterprise culture consists of intangible topics like expectations and tolerance. The enterprise structure consists of tangible topics like formalized responsibilities. The enterprise strategy comprises a mixture of both, with purpose and goals intentionally characterizing where to go, approximated by clearly defined performance indicators and initiatives. The enterprise culture is as individual as personalities in the enterprise team, and their behaviors.

All three design factors are described by appropriate models. In this sense, our approach is based on the OSP reference enterprise model as well as on prescriptive models in the classical sense of model-based development [CK20].

Culture Factor. The *culture factor* describes intended and actual behavior of the enterprise team, and initiatives to evolve it. Leitbild documents and code of conducts formalize aspects of intended behavior through values, norm, and rules, and align understanding in the team.

From a human-centric perspective, the evolution of culture is based on the acceptance that there remains an intangible part, which can neither be fully defined nor directly be measured, or which is left intentionally open. Examples of the remaining part are informal communication channels and “hidden rules”, which the enterprise team is not even aware of. Creativity is an example of a typical Leitbild value, which can be stimulated, whose outputs can be measured and sometimes be forecasted, but not be determined in advance. The evolution relies on stimulation through framework conditions, and intense communication (e.g. reflection on intended culture, feedback on behavior, positive and negative examples, or role models). Rituals and symbols support the perception of a certain style and the forming of a team identity.

Due to its intangible nature, the evolution of the enterprise culture progresses slowly and requires steady impulses and great foresight. Alignment with the evolution of strategy and structure is mandatory (e.g. which project supports which values and should be highlighted appropriately, which project might be perceived as conflicting with certain values and must be adjusted or strongly supported), but might cause trade-offs with regard to timelines. In general, leadership teams must be aware, if their actions are conclusive. In many Leitbild documents as models of the culture factor, one can find the values openness, credibility, and motivated employees. But if, e.g., open-space offices are introduced and cost saving measures let the employees sit together so close that the

true motive becomes obvious, but the leadership team keeps referring to employee motivation and denying the cost saving motive, the culture is harmed and the Leitbild better had never been written.

If CSR activities (corporate social responsibility) are considered important, they should also be included into the culture design and their value contribution be linked to enterprise goals instead of handling them as a social fig leaf [Po06].

Strategy Factor. The *strategy factor* details how the enterprise fulfills its purpose and comprises, and might be described by several types of modeling approaches:

- value creation design (incl. purpose, value proposition, value chain, income cost ratio), visualized e.g. by business model canvas [OP10],
- goals and objectives, expressed e.g. with a balanced score card [KN96],
- evaluation of impact factors, e.g. according to SWOT matrix [Hu05],
- CSFs [Me16] including maturity states of enterprise design,
- visualized target picture (scenarios for CSFs or customer journeys [FK18]),
- the most limiting factors of further prosperity [FM09]
- transformation roadmap based on program portfolio management techniques [PM17] including priority setting and resource allocation,
- communication concept, e.g. using story-telling techniques [Bo08].

These results and the implementation of the transformation roadmap are provided by the *strategy management process*, which is organized within the design factor structure. The strategy management process also identifies relations with culture and structure, to ensure that restrictions and needs for transformation are identified, that appropriate decisions are made, and that measures are synchronized and included into the transformation roadmap. With culture e.g., the way customers are addressed, ethical products and production, targeted enterprise image, communication strategy. With structure e.g., elements of the value chain to be organized, restrictions by risk profile.

Structure Factor. The *structure factor* implements the value creation design of the strategy factor into how the enterprise team provides these values. It comprises process flows and conditions, responsibilities and communication, roles, and their owners. The used models are architectures, which are kept mutually aligned:

- business architecture,
- process map (management process, core processes, support processes),
- operating model (policies on variability vs. stability, centralization vs. decentralization, differentiating vs. non-differentiating)
- organization and governance structure,
- information architecture (data, systems, networks),
- infrastructure architecture (physical locations and capacities).

The design must not stop with formal elements. Also, decisions must be made, how informal communication and informal communities shall be handled in the enterprise and to which extent they shall be involved into the structure design. Guidelines and policies help to stimulate e.g. reflection workshops or engagement in social media

groups and clarify budgets for provisioning of required infrastructure. In case of designing skill profiles, either for special roles or in a general way, attention must also be paid to soft skills like social behavior, communication style, teamwork, etc.

The management process comprises the strategy management process, covering the evolution of the enterprise, and the operation management process, covering the execution of the enterprise activities. The strategy management process is divided into the two subprocesses *strategy development* and *strategy implementation* [Ro19]. Outcomes of the first subprocess are the current and planned status of the design factors and the synchronized transformation roadmap. The second subprocess comprises the execution of the roadmap and the accompanying organizational change and risk management.

3.3 Reference Enterprise Model

The *reference enterprise model* embodies the idea of how to evolve the Orchestrated Solution Provider (OSP) as the new type of enterprise in the knowledge society. It represents the second of the three enterprise model layers (cf. Fig. 3.1). It also consists of the building blocks personas and impact factors (context, constituent, critical success, design, orientation), as introduced in the OSP-EM taxonomy (cf. Fig. 3.3). It is built upon the idea of a value-based targeted enterprise and thus refines and supplements the respective elements of the conceptual enterprise model. The driving refinement is a reference set of CSFs, which is derived from the general impact of the knowledge society and further on translated in respective refinements of all impact factors. Since the OSP can only fulfill its CSFs by sophisticated use of digital technologies, the enterprise design of the OSP is digital. Therefore, the evolution of an enterprise design according to the OSP enterprise model is a digital transformation. This goes clearly beyond improvement of the existing business model.

Personas

Personas change their expectations and behavior as society progresses into the knowledge era. The absence of absolute truth, the increase of multiple options, and of intense self-reflection foster individuality and self-responsibility. The personas elements of the conceptual enterprise model are refined towards the reference enterprise model by profiles to study expectations and behavior. Subsequently, basic profile descriptions are proposed.

Customers as *external personas* are more and more demanding. Not least because of social networks and of ubiquitously available data, they are well-informed, and they use multiple channels to connect. Thus, winning new customers and intensifying their loyalty is an increasing challenge.

The role of the *entrepreneur* also changes. Increase of dynamics, knowledge and options turn command and control styles into bottlenecks and request collaborative styles like moderator and motivator, to unleash team-intelligence [Ru17, Se19]. This is amplified through self-organized networks inside the enterprise and in its context. The entrepreneur must be aware that even the purpose of the enterprise must not be considered as solid. Hence, he must cultivate her/his sense, if and when to change the purpose.

Enterprise teams do not function as deterministic input-output units. Respective work is replaced by machines. Instead, social, and intellectual skills become more important, and the borderline between private and professional life is diminishing. The workplace and the purpose of work become an integral part of personal life. Enterprise teams constantly self-reflect their work and consider measures to improve.

Impact Factors

Context Factors. The dynamics of the *context factors* increase, and events anywhere can have an immediate impact everywhere else due to strong and far-reaching network connections. Thus, detection and reaction better occur instantly. This calls for predictive data analysis and measures to improve resilience. There are relevant trends in all PESTEL dimensions. Sustainability in ecology, growing demand for healthiness in society, accelerating innovations in technology. This leads to new products and services. Thus, one-time analysis is not sufficient. But methods are established (e.g. trend radars or big data analysis), which support steady analysis and continuously updated predictions and scenarios.

Orientation Factor. In the dynamic context of the knowledge society, the importance of the enterprise's purpose increases for orientation and motivation ("north star"). Nevertheless, it must allow fundamental questioning if there is a need to do so. Otherwise, an enterprise might lose its elasticity and resistance to change grows. This is a topic hardly to be formalized but left to the sure instinct of the entrepreneur.

Constituent Factors. In dynamic contexts, *constituent factors* are rather guidelines than detailed prescriptions. They give the enterprise team orientation and leave the right amount of freedom to act. The purpose is essential for the orientation and the value base provides a solid foundation for the team's behavior. The entrepreneur should be clear in expectations and limitations regarding chances and risk and her/his space for intervention.

Critical Success Factors. The *Critical Success Factors (CSFs)* are individual for each enterprise according to the impact of the context factor on its concrete business model. But the fundamental changes to the knowledge society imply criteria which become relevant for most likely any enterprise. They form a starting point for evaluation and continuous evolution and characterize the *orchestrated solution provider*, who

- pursues a purpose with focus on customer benefit and social responsibility,
- offers individual solutions from integrated products and services as close to real-time provision as possible (e.g. real-time tracing of transportations),
- continuously shapes its strategy and operational behavior to open and utilize new purpose fulfilling opportunities,

- uses state-of-the-art technology and guides its behavior by intense analysis of data and by exhaustive usage of performance indicators,
- orchestrates dynamic networks of self-organized teams internally and independent business partners externally, and allocates resources as needed,
- establishes and develops working conditions which are perceived as attractive and which promote creativity and open collaboration.

Design Factors. In the reference enterprise model, the evolutions of the *design factors* are organized as steady processes each, synchronized into a holistic transformation roadmap, fueled by the reflective behavior of the enterprise team, and embedded into a rapidly changing context. Numerous options, continuous change, self-organization, and increasing creativity can let the enterprise team get bogged down, not allocate limited resources to the right priorities, and finally miss a successful evolution. To mitigate this risk, we introduce the *Targeted Adaptive Evolution (TAE) principle* as a general habit and as logic of procedures, and *entrepreneurial cells* as concept for organization structures.

TAE Principle. The *TAE principle* is the underlying concept for procedures to manage progress in dynamic, complex situations and requires cultural prerequisites to be applied successfully. It enhances known techniques for stepwise, iterative progress with guidelines to keep track of progress and resource control: *hypotheses-based evolution loop, life phases and maturity grades, 4 horizons leadership calendar*.

(1) hypotheses-based evolution loop

In a complex environment, iterative, stepwise approaches are required, which also include systematic reflection and learning (see e.g. PDCA cycle [De82], the lean startup method [Ri11]). We structure the often-used build-measure-learn evolution loop into 4 steps *Evaluate, Plan, Prepare, Execute*:

- *Evaluate* reflects the objectives, evaluates insights into the subject domain, its context and into the solution requirements, evaluates the learnings made so far and solution options, updates the task backlog and decides on the option to follow (if at all), on the solution approach to take or a hypothesis to be tested [GY20] and on performance measures to be implemented.
- *Plan* defines the next solution by selecting tasks from the backlog, either as a solution update or as a tested hypothesis. The scope is limited for fast execution as it is e.g., practiced with sprints in Scrum. This step is aligned with the overall program management to identify and resolve dependencies between various initiatives, and to agree on resource allocation. It ensures preparation of required change management activities; it may add dedicated reflection activities and initiatives which foster experience of cross-team successes and promote enterprise-wide solidarity. Dependent on the extent of change, the subsequent execution can require further steps to adjust or modify the solution approach. It defines the communication

model and the performance indicators, to control the progress of the initiative and the result achievement.

- *Prepare* ensures an efficient execution, provides required infrastructure and resources, involves all affected people, informs about the initiative, empowers and enables the right people [AN14, KC02].
- *Execution* implements the defined scope or validates the hypothesis. Intense communication keeps the team aligned.

(2) life phases and maturity grades

In a dynamic environment, any enterprise object (product, process design, machine, IT systems, business model) can fulfill its requirements only during a certain period. To actively manage a healthy state at any point in time, a life phase and a maturity grade are assigned to any enterprise object. This supports to qualify development needs, control progress, and to balance resource allocation.

(3) 4 horizons leadership calendar

Enterprises follow the *principle of economic efficiency* and activities compete for scarce resources. Especially in dynamic contexts or when cannibalizing initiatives are driven, the enterprise team must give the right attention to each initiative and spend sufficient time on reflecting its activities. Therefore, a scheme is applied to allocate and control resources along 4 horizons: (1) daily operations, (2) optimizing daily operations and removing ballast of the past, (3) ongoing initiatives, (4) future initiatives after ongoing are finalized. This scheme is used to set up a leadership calendar which distributes the available leadership time to these 4 horizons.

The hypotheses-based evolution loop is not about process organization only. It is embedded into a cultural context which fosters agile mindset and behavior. Teams trust each other for open communication and direct feedback, which is practiced intensely. Joint striving for benefit endowing results nurtures performance orientation and collaboration “across siloes”. Teams are equipped with as broad a range of competencies as necessary and have autonomy to make rapid decisions. Early results are preferred over long analyses, experimentation is encouraged, and failures are accepted as learning opportunities, and quickly corrected. Establishing such a context can be a challenge.

Entrepreneurial Cells. An entrepreneurial cell (short: cell) is the approach to yield a flexible structure in the OSP enterprise model. The cell implements a single element of the value chain and provides its solution results with a maximum of self-containment, from side-effects with other cells as free as possible [We76]. The cell may be composed of smaller cells and their relationships, and it may have relationships with other cells for solution reception and provision. These relationships are based on clear result and performance commitments. The enterprise is seen as the top-level cell, which has external relationships with its business partners, suppliers, and customers.

The cell has attached a life stage and a maturity grade, to support enterprise-wide allocation of resources and prioritization of initiatives. They are derived from the business models, which the implemented element of the value chain belongs to.

Self-containment of the cell is supported mainly by the three factors *mixed teams*, *service-oriented enterprise architecture*, *service-oriented performance controls*:

- The *mixed teams* are built upon all skill groups required to deliver the results committed. The teams follow the enterprise value base and organize themselves, choose methods and tools to their needs, compliant with enterprise-wide standards, ensure cross-team communication and collaboration. They participate in cross-cell skill groups for knowledge exchange and to develop their individual skills [WW19].
- The *service-oriented enterprise architecture* [AA15] provides the structural alignment of business and information architecture. Information architecture provides self-contained information services, which are ubiquitously available, up and down scalable, modifiable and exchangeable, secure and robust as required. They can be flexibly composed to orchestrate new information services and they limit dependencies between cells by avoiding an intensely mashed information architecture.
- *Service-oriented performance controls* measure value contribution against the performance level committed and according to actual service consumption, which is supported by the end-to-end cell structure.

Based on the TAE principle and the concept of entrepreneurial cells, we describe how the design factors are refined in the reference enterprise model of the Orchestrated Solution Provider (OSP) as the new type of enterprise in the knowledge society.

Culture Factor. For the *culture factor* values like customer-orientation, trust, curiosity, and courage along with social responsibility are eminent. Creating enthusiasm is accepted as a major leadership task and the evolution of the respective culture is stimulated accordingly. Collaboration is strengthened “cross siloes”, and performance increased by honest, intense, and direct feedback. CSR is fully integrated into the enterprise value chain [Po06] and intensifies the relevance of the purpose. The leadership team, starting with the entrepreneur her/himself, acts as a role model of how to behave according to the enterprise’s values and change their leadership style from commander and controller to moderator and motivator [Se19]. They demonstrate personal engagement for trust, open communication, and continuous search for the best way to fulfill the joint purpose of the enterprise [Hu11]. This also fosters a performance culture and supports constant change becoming a natural habit of enterprise life. The evolution of the culture factor is driven by a process which follows the TAE principle and fosters steady stimulation, and steady reflection of behavior.

Strategy Factor. The steady evolution of the strategy factor by an established strategy management process, which integrates the TAE principle, is the leading mechanism for digital transformation and continuous evolution. It steadily evaluates the impact factors with a broad sense and adjusts the backlog of initiatives for strategy implementation. The risk profile is steadily managed with a wide lookahead, to keep the balance between opening new opportunities and mitigating risks. Implementations of initiatives are organized as quick sprints and respect MVP (Minimal Viable Product) criteria [Ri11]. Program management techniques are applied for the synchronization of ongoing initiatives and for the management of the backlog. The steps *plan* and *prepare* of the TAE loop synchronize with organizational change management and respect self-reflecting

and self-organizing teams. They are involved early and openly, to raise understanding and support of initiatives planned [An14, KC02].

Since the business model of the enterprise cannot be considered as stable, neither the business model becomes also subject to a steady management process following the TAE principle. A single business model is replaced by a portfolio of business models, which represents different life stages and multiple options to enable sustainable success [GF14]. Also, the purpose might be questioned, but with an incredibly careful mindset.

Structure Factor. In a “Modern Firm” [Ro07], the evolution of the *structure design* is a steady and holistic task, closely interwoven with the evolution of the culture and the strategy, steadily implementing new requirements and insights, improving flexibility, resilience, transparency and efficiency to fulfill the CSFs of the enterprise. New products, new customer segments, new production methods, new supply chains, or growth beyond existing capacity are exemplary triggers which require to reflect an existing organization and to potentially change it. The OSP model organizes the evolution of the structure design by a steady process which follows the TAE principle.

In the OSP enterprise model, the structure design is an *orchestrated network of loosely coupled entrepreneurial cells*, which maximizes adaptability of the enterprise and minimizes side-effects of changes [We76]. The orchestration of this network is subject to the enterprise-wide structure design process and starts with level 1 elements of the value chain. The major task is to define orchestration guidelines and to design the layout of the next level of cells. Proven orchestration guidelines build on the operating model criteria described by [RW06] and require decisions, which services become an enterprise standard for efficient reuse and stability, and which services will be independent for increased variability, which services are differentiating and kept inhouse, and which services are not, thus sourced from partners. Customer-oriented criteria like the life states of business models and maturity of the provided solutions help to resolve these trade-offs. Enabling functions are linked with the primary value creating cells by staffing the mixed teams of the cells with appropriate skills, and coordinate skills development across all cells. This is a steady and dynamic task in an enterprise-wide responsibility. Enabling functions also provide requested standards and policies. HR, e.g., takes a special focus on developing soft skills and culture. Finance, e.g., provides performance data in line with the cell structure, to support solid decisions, e.g., on external service sourcing, consumption-based pricing models. There is also an enhanced role of managing the enterprise’s eco system, to build enterprise-wide strategic partnerships and to establish the right conditions for dynamic collaboration models.

Informal communication, communities of practice, social workshops, participation in external social media groups, or creativity events like hackathons are supported by clear guidelines and policies [WM02]. Since communication and value-based behavior are essential, evolution of soft skills is critical.

3.4 The Concrete Enterprise Model

The concrete enterprise model describes the design of a real enterprise and enables its continuous evolution under the conditions of the knowledge society, according to OSP-

EM and the flexible human-centric enterprise. It represents the third model layer (cf. Fig. 3.1).

Enterprise Model derivation. The derivation of the concrete enterprise model from the reference enterprise model is called the *implementation* of the OSP enterprise model. The implementation is done by detailing the elements of the reference enterprise model, to represent at least the current and a target design state of a real enterprise as required to support the enterprise transformation roadmap.

The enterprise model is also implemented stepwise by applying the TAE principle. This leads to a model evolution roadmap which must be aligned with the enterprise evolution roadmap to ensure that the evolving model always covers, what the next enterprise evolution step requires, and to comprise a sufficiently detailed *big picture* of the enterprise to provide guiding context information for the next enterprise evolution steps. Thus, organizing this alignment follows the pattern of a *co-evolution process* (cf. Fig. 3.4).

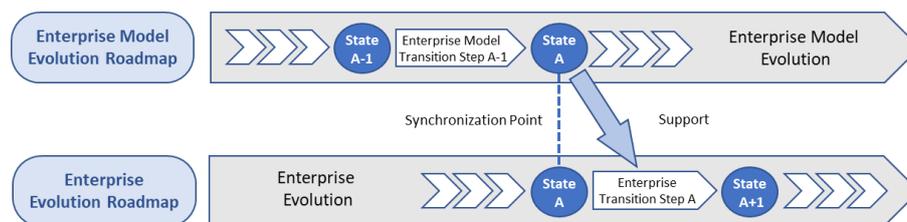


Fig. 3.4: Co-Evolution Process

The *big picture* of the enterprise answers at least on a high level:

- Which purpose is pursued and how is it communicated?
- Which values and behaviors characterize the culture?
- Which strategy is followed, what are the most important messages?
- What are the major strategic initiatives and their priorities?
- What is critical for success?

Questions which drive the enterprise evolution and are answered through strategic initiatives which require appropriate model support for affected domains are e.g.:

- Do cultural and infrastructural conditions support New Work solutions?
- What is required to experiment with a new service idea?
- Which bottlenecks avoid half cutting the time to market of new services?
- What is the impact of providing omnichannel experience to customers?
- What is required to introduce predictive maintenance into production lines?
- Where can entrepreneurial cells be piloted best? Who must be involved?

Value contribution. OSP-EM enables the enterprise team to identify and define transformation initiatives for an *effective* evolution of their enterprise in the knowledge society:

- The strategy management process utilizes a network of impacts which comprehensively respects opportunities and threats from the knowledge society to translate these influences via CSFs into objectives for the enterprise evolution which enable fulfillment of the enterprise purpose.
- The design factors culture, strategy, and structure allow to build a holistic, human-centric transformation roadmap that meets the evolution objectives.
- The evolution loop of the TAE principle establishes an enterprise-wide iteration rhythm which defines the backbone for the enterprise's ability to act swiftly and integrates a mechanism for reflection and continuous optimization.
- Loosely coupled cells enable flexible orchestration.
- The CSF maturity grades foster a differentiation between digitized and digitalized design states, hence mitigate the risk to mistake digitization measures (like process automation or mobile workplaces) already as digitalization.
- Co-evolution ensures that enterprise evolution and model evolution are aligned towards the same evolution objectives and are synchronized in small, iterative transformation steps.
- The 4 horizons of the leadership calendar support the leadership team to allocate their required attention to future-oriented tasks.

OSP-EM enables the enterprise team to *efficiently* conduct transformation initiatives:

- The end-to-end traceable value contribution, from initiatives over design factors to CSF fulfillment and purpose achievement, fosters team motivation and supports setting the right priorities.
- Loosely coupled structure, performance culture and self-organized teams unleash available energy and allow a high degree of simultaneous activities.
- The progress of all initiatives, including the evolution of OSP-EM itself, is consistently managed by a comprehensive roadmap which keeps available resources under control, including management attention (4 horizons of the leadership calendar), and respects dependencies of the initiatives.
- Small iterative steps including holistic change management provide early results and allow for swift adaptation to changing requirements.
- Steady analysis of environment factors, CSFs and transformation status provide the enterprise team continuously with a realistic big picture of the actual enterprise design state and hence support managing complexity.

The *success criteria* met by the implementation process of OSP-EM are:

- 1) The entrepreneur and the leadership team do actively support the approach and accept OSP-EM as a strategic instrument for themselves.
- 2) The concrete enterprise model has an appointed owner and full transparency is given for the evolution of the enterprise model, its outcomes and the resources needed.
- 3) Benefits are made measurable by linking OSP-EM to other initiatives supported and by measuring leadership time spent for the "4 horizons".

4 Digital Transformation of Enterprises

OSP-EM realizes the digital transformation of a specific enterprise as a roadmap of transformation steps towards a digital enterprise design and embeds this roadmap into the framing process for continuous evolution of the enterprise. This corresponds to the execution of the strategy management process in the concrete model of the enterprise. Thus, applying the concrete enterprise model for digital transformation and implementing the concrete enterprise model must be aligned via co-evolution, which basically follows three phases (cf. Fig. 4.1):

Phase 1: Prepare the ground

Phase 1 aligns the ideas and the understanding of how to apply OSP-EM to the evolution of the enterprise with the entrepreneur and the leadership team. It allows agreement on success factors and on how to proceed. Since the entrepreneur, her/his expectations, her/his ideas, her/his behavior are decisive for the success of the transformation it must be clarified in this step if he is aware of this significance and of the impact on her/his current role and if he is willing to change personal behavior as required. This is a prerequisite to gain the necessary leadership support which then allows to communicate and organize the next steps.

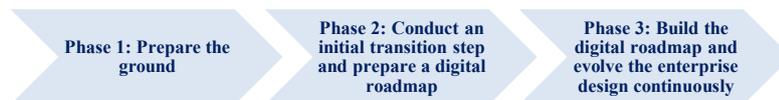


Fig. 4.1: Phases of Digital Transformation of Enterprises

Phase 2: Conduct an initial transition step and prepare a digital roadmap

Phase 2 lets the leadership team experience how to apply OSP-EM to a small transition with a real topic, introduces the 4-step-approach according to the TAE principle, which will be continuously iterated. It provides insights in how to tailor OSP-EM to the specific enterprise and prepares the initial digital roadmap of phase 3.

First step, select a strategic question of interest, which is assumed to be answered within a few weeks and which is limited to a small range of enterprise domains. Introduce the concrete model of the enterprise for the current and the target design state by a “light weighted” execution of the strategy process. This establishes the initial state of the concrete enterprise model and provides a big picture of the enterprise and of the scope to be investigated down to the details the description of the solution context for the selected question requires. The big picture covers at least working hypotheses for all impact factors and design factors according to the taxonomy terms.

Second step, build the roadmap of steps to solve the strategic question selected, communicate the initiative, and establish what is minimally needed for the first step.

Third step, apply the model built to conduct the first transition step of the roadmap.

Forth step, draw conclusions, tailor and improve for next iteration steps.

Phase 3: Build the digital roadmap and evolve the enterprise design continuously

Phase 3 is the entry into the continuous evolution process by reiterating the steps of phase 2, enhancing and detailing the results to an initial digital roadmap in the first iteration. This roadmap shows by which transition steps the enterprise design is supposed to reach a digital state, which defines the enterprise as *digital ready*.

The first reiteration of step 1 focuses on impacts caused by the knowledge society and the definition of the respective CSFs for the targeted business model of the enterprise. Thereby, it defines at least an initial targeted digital enterprise design. It also defines the (digital) maturity grades of the CSFs, which fit into the situation of the enterprise. It sets the structure, and objectives for the construction of the roadmap of transitions steps, and initiatives to reach the various maturity grades. Subsequent iterations will evaluate new insights into any impact factors (e.g. by focused investigations conducted or by successful innovation initiatives) and update the business model, the CSFs, and the roadmap, respectively.

5 Conclusions and Future Perspectives

Development of society, enterprises and technology are interdependent. They are triggered and followed by changing human behavior. Therefore, enterprises must be evolved holistically and centered by humanity. Also, importance of values, purpose, self-realization, and self-organization is increasing. Thus, the role of the entrepreneur also changes, from a commander and controller towards a moderator and motivator of enterprise teams and eco-systems. But the role as such will remain of eminent importance, while facing a new level of complexity.

The presented OSP enterprise model and the methodical, model-based approach OSP-EM consider all these aspects and support the entrepreneur and the enterprise team to conduct a digital transformation and to further evolve the enterprise. OSP enterprise model and evolution method are based on scientific results, on deep industrial experience, and on a conviction that human centricity is key as the people make the difference. In this sense, the OSP follows the vision of Industry 5.0 for a sustainable, human-centric and resilient European industry, while going far beyond with its holistic view [EC21].

Investigation of enterprise and transformation patterns as well as the creation of OPS-specific modeling languages will further evolve the approach. They will increase efficiency especially in overly complex situations and will uncover further interdependencies between impact factors introduced.

Our holistic approach is based on scientific insights from different disciplines. We see a strong need in intensifying such an interdisciplinary approach where sociological system theory becomes stronger aligned with economic and technological viewpoints. This will also sharpen and extend the competence and activity profile of enterprise engineering teams and their responsibility for digital transformation.

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