Empirical Research Paper

The project-oriented organisation through the lens of viable systems

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ABSTRACT

Organisations are increasingly implementing projects to respond to growing complexity and changes in their environments. Such organisations are referred to as project-oriented organisations. This organisation type has been described with regard to value-based, people-based and structure-based competencies. To strengthen the theoretical underpinning of the competence model of project-oriented organisations, we adopt the cybernetic perspective of viable systems developed by Stafford Beer. We conceptually derive survivability, sense-making and futureability as central competencies of viable systems and relate them to such organisations. In doing so, the paper strengthens the theoretical understanding of project-oriented organisations and contributes to a simplification of the model of viable systems. From a practical perspective, we empower organisations to increase their viability by leveraging their viable competencies.

1. Introduction

Nowadays, organisations find themselves in environments of constant change, which are increasingly complex and uncertain, and, consequently, most face the challenge of adapting and evolving to the future faster than ever before. According to Boulton et al. (2015), organisations are a part of systemic and multi-scalar environments, full of variety, diversity, variation and fluctuations, which are path dependent, change episodically, possess more than one future, are capable of self-organizing and self-regulating and, sometimes, give rise to novel, emergent features (p. 36). An increasing number of organisations are using projects to respond to this need for constant change. Projects enable them to have the necessary adaptability to respond to complex and uncertain situations (Schoper et al., 2018). The use of projects makes organisations capable of solving complex problems more flexibly and innovatively (Lundin et al., 2015). In this context, organisations that primarily undertake projects are referred to as project-oriented organisations. A *project-oriented organisation* is one that defines its organisational strategy in terms of project *management*. This means that the company uses projects to carry out complex processes, has an explicit project management culture and sees itself as project oriented (Gareis and Huemann, 2007). Traditionally, project-oriented industries are construction or mechanical and plant engineering ones. Organisations increasingly use internal projects for strategic planning, e.g. marketing, human resource or organisational development projects (Huemann and

Silvius, 2017).

How project-oriented organisations need to be designed is a question that has not yet been extensively researched. Gemünden et al. (2018) propose an organisational model that can improve the understanding of how and why project-oriented organisations contribute to business success: the *competence model of project-oriented organisations*. This model describes project-oriented organisations with regard to value-based, people-based and structure-based competencies. To provide a better understanding of project-oriented organisations and their design, we instead look at them from a perspective that has not been considered before: the cybernetic perspective. To do so, we apply Beer's (1984) cybernetic viable system model (VSM), which is critical to cyberneticists as a guide for organisational design (Beer, 1984; Schwaninger and Scheef, 2016). The VSM addresses the viability of organisations and identifies the necessary and sufficient structural conditions that result in such viability. Here, viable systems are those that are capable of independent existence. Organisations need to possess the competence to respond to unexpected events and to evolve and adapt to the changing environment (Espejo, 2003). Thus, a viable organisational design enables an organisation to survive over the long term. Therefore, we pose the following question: How can the viable system model be applied to the competence model of project-based organisations?

In the present paper, we contribute to a better understanding of project-oriented organisations and validate the design concept of the competence-based model through a theoretical analysis using

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competencies for viable organisations. In doing so, we aim to leverage the concepts from the cybernetic world to enrich research on project-oriented organisations. In addition, we enable a better understanding of the complex VSM.

We take a two-step approach. First, based on a semi-structured literature review, we analyse the VSM and use it to identify the competencies needed to design viable organisations. This allows us to simplify the complex systemic structure of the cybernetic model, hence creating a fundamental description of viable organisations based on competencies. In the second step, these competencies are used to explore the extent to which the competence model of project-oriented organisations may be viewed through the lens of viability. To this end, a set of propositions is presented.

The structure of the present paper is as follows: After the introduction, the second section introduces the core concepts, first, with regard to project-oriented organisations and the competence model of project-oriented organisations, according to Gemünden et al. (2018), and, second, in relation to the concept of viability and the VSM, according to Beer (1984). In the third section, we show how project-oriented organisations can be strengthened by applying the VSM and presenting three sets of propositions.

2. Theoretical background

2.1. Project-oriented organisations and the corresponding competence model

2.1.1. Project-oriented organisations

Projects and project-oriented organisations have become a common form of work organisation in recent decades, as shown by the emerging terminology of *projectification* (Gemünden et al., 2018; Keegan and Turner, 2002; Schoper et al., 2018). According to Gareis (2005), project-oriented organisations have the following characteristics: a consciously chosen organisational strategy, such as *management by projects*, which is characterised by teamwork, process orientation and empowerment and in which projects and programmes are managed as temporary organisations. Following Gemünden et al. (2018), a project-oriented organisation can be described as an 'entrepreneurial, future- and stakeholder-oriented innovating organisation, which uses projects as temporary, task-focused organisations, to define, develop, and implement its strategies, to transform its structure, culture and behavior, and to define and develop new products, services, and business models' (p. 147). Gemünden et al. (2018) show, through their competence model of project-oriented organisations, that project-oriented organisations have certain competencies that allow them to fulfil their specific tasks.

2.2. The competence model of project-oriented organisations

Gemünden et al. (2018) conceptualise a model for designing a project-oriented organisation: the competence model of project-oriented organisations. The model contains three dimensions that can each be separated into three organisational competencies: *structure*, *people* and *values* (see Table 1). The competence model is based on the competencies of highly innovative organisations that are top performers in their industries and, thus, have the ability to thrive in an ever-changing environment (Gemünden et al., 2018).

The first dimension consists of the following competencies: *organisation, planning and control* and *ICT systems*. *Organisation* comprises a specific organisation's competence to build appropriate structures and processes, as well as the integration of project work into the company-wide management and process landscape. *Planning and controlling* help manage and control the processes through business plans and strategies that are realised through the organisation's projects (Kopmann et al., 2017). Furthermore, this competency helps regulate the management of planning and controlling across all hierarchical levels and functional areas in an integrative manner. This creates transparency and optimises the decision-making processes. *ICT systems* make projects work as effectively and efficiently as possible through meaningful and user-friendly communication and information tools (Gemünden et al., 2018).

The second dimension, *values*, includes *future orientation, entrepreneurial orientation* and *stakeholder orientation*. *Future orientation* is defined as the prioritisation of one's future success with regard to one's current success to create results that enable a better future. To achieve this, people in various roles who contribute to the management of projects must be empowered. *Entrepreneurial orientation* is described as 'the entrepreneurial strategy-making processes that key decision makers use to enact their firm's organisational purpose, sustain its vision, and create competitive advantage(s)' (Rauch et al., 2009, p. 763). *Stakeholder orientation* refers to cooperation among functions, hierarchical levels and external partners (Gemünden et al., 2018). Within this, the cooperation of various stakeholders enables one to frame and solve problems better and more quickly.

The third dimension consists of the following elements: *teamwork, competence development* and *knowledge management*. *Teamwork* refers to learning and working in projects and throughout project work, which enables employees to be initialised, motivated, encouraged and assessed during their daily project work. *Competence development* helps build employees into current and future project managers. It is promoted by offering learning opportunities and cooperative working environments, especially regarding recruitment, employee development, job descriptions and staffing, along with the incentivisation of performance. Furthermore, it entails a system of different career paths, including a project manager path. *Knowledge management* promotes the acquisition, exchange, safeguarding, dissemination and use of content- and process-related knowledge about project work (Gemünden et al., 2018).

In summary, the competence model integrates the contributions of very different management disciplines that have been applied in the field of projects, such as organisational theories, strategic theories, planning and controlling. It also integrates all levels of project management, that is, individual projects, project portfolios and project-oriented organisations (Gemünden et al., 2018).

2.3. Viability and the viable system model

2.3.1. Viability

Viability refers o 'the ability to live, grow and develop', 'the ability to function adequately' or 'the ability to succeed or be sustained' (Merriam-Webster, 2021). We conceive of viability as 'capable of living' and define it as 'the ability to maintain a separate existence' (Simpson and Weiner, 1989, p. 588). An organisation can be designed as a system with regulatory learning and adaptive capabilities to ensure its viability when faced with changes that may occur in its environment, even if these challenges were not foreseen in its design (Burgess and Wake, 2013).

2.3.2. The viable system model

The VSM compares the viability of an organisation to the nervous system of a human organism (Schwaninger, 2001); it defines the requirements for its design. Most approaches for designing organisations focus on improving value chain processes without having a clear understanding of how they interact with the variety of organisational

Table 1

Competence dimensions according to the competence model of project-oriented organisations.

Structures	Values	People
• organisation	• future orientation	• teamwork
• planning and controlling	• entrepreneurial orientation	• competence development
• ICT systems	• stakeholder orientation	• knowledge management

processes. Organisational design needs to go beyond isolated improvements to create organisations capable of creating and regulating intended goals and values (Espejo, 2003). To achieve this, the VSM addresses organisational viability while providing the necessary and sufficient structural conditions for it as a basis for designing system viability (Schwaninger and Scheef, 2016).

All viable systems share a number of essential systemic functions (Brocklesby and Cummings, 1996): some form of autonomous operational elements that relate directly to the external environment and that constitute the identity of the system (System 1); coordination functions that ensure that the operational elements work together harmoniously (System 2); control activities that manage and allocate resources to the operational system, audit functions that monitor the performance of the operational elements (System 3); intelligence functions that consider the system as its strategic system and opportunities that monitor the performance of the operational elements (System 4); and, finally, an identity function that understands the organisation's purpose in the world in relation to its various components and other systems to which it might belong (System 5). If the organisation is to remain viable in its environment, the variety of the organisation must at least match that of the environment (Espejo, 2003). This principle is based on Ashby's law of requisite variety (Ashby, 1956). Consequently, organisations must be able to adapt to actual and potential systemic conditions within their environments, which may affect their identity or 'raison d'être' (Brocklesby and Cummings, 1996, p. 50).

Socio-cybernetic theories, such as the VSM, have been increasingly recognised for their theoretical plausibility (Schwaninger and Scheef, 2016). However, criticisms relate to the hierarchical arrangement, authoritarian nature and lack of flexibility of the VSM. Moreover, the lack of formalisation and clear procedures for application has been mentioned (Flood and Jackson, 1988; Jackson, 1986). We seek to address these criticisms and conceptualise an applicable framework that allows for a better understanding of viability.

3. Relevance and methodology

3.1. Relevance of analysing project-oriented organisations from a cybernetic perspective

A review of the relevance of the competence model for project-oriented organisations is imperative, so it is essential to analyse the model from different perspectives. Project-oriented organisations find themselves in environments of high complexity. Researchers state that current management thinking stems from the technology-oriented mindset of the 1960s, which cannot deal with the complexity that has evolved (Ellis, 1995). What is needed, Ellis argues, is a systems approach. Consequently, it is useful to take a cybernetic view, and here, the VSM offers a systemic approach to managing this increased complexity while providing insights into an organisation's future and survival capabilities. However, the VSM has not been the focus of consideration for the transfer and integration of the concept of a project-oriented organisation, even though the VSM has attracted a great deal of attention in cybernetics and is also a referenced theoretical framework in management sciences, where it is used as a guide for the design of viable organisations (Schwaninger and Scheef, 2016). Despite its scientific relevance, the model's entry into concrete organisational practice has not occurred because of its high degree of abstraction. In light of these considerations, we aim to address this lack of applicability of the VSM to make it more accessible for scholars and practitioners alike.

In summary, viewing project-oriented organisations through the lens of viability will allow us to address two research gaps: First, we can answer the question of how project-oriented organisations can orient themselves to cope with complexity. Second, we can provide suggestions on how to simplify the VSM by defining the competencies of viable organisations that emerged from the model. This will improve the understanding of how the VSM can be applied as a design guide for organisations.

3.2. Developing competencies based on the viable system model

To answer the research question presented above, we performed our research based on the following steps (see Fig. 1): First, we conducted a semi-structured literature review to gain an understanding of viability and project-oriented organisations. We also reviewed the models on viability (the VSM) and the competence model of project-oriented organisations and analysed their components. Second, we used this knowledge to derive competencies of viable organisations, and, third, we derived propositions that show how the competence model relates to the competencies defined.

We reflected on the VSM to reframe a systems-based approach and developed a set of competencies for designing viable organisations. Using a semi-structured literature review following Wong et al. (2013), we deepened our understanding of the VSM and the competence model of project-oriented organisations. The semi-structured literature review aimed to identify potentially relevant research directions that have implications for the topic under study (Wong et al., 2013). A detailed overview of all the reviewed contributions can be found in the appendix. In a second step, we established a set of categories classifying the results of our literature review into *survivability*, *sense-making* and *futureability*. This allowed us to break up the systemic view and elaborate on how to design viable organisations based on competencies. Hence, the cybernetic view of organisational design is transferable to the context of project-oriented organisations. To do this, in a third step, we introduced three sets of propositions to show how to apply the VSM to the competence model of project-oriented organisations using the previously elaborated viable competencies for the design of viable organisations.

To illustrate our pragmatic approach, which highlights the usefulness of our research, we integrated the elements of inquiry proposed by Lorino (2018) into our three-step method: existing practice regarding the situation, problematisation, a working hypothesis, propositions, experiments and new practice in the determinate situation. The first element is existing practice, which, in this paper, relates to project-oriented organisations. These types of organisation are becoming increasingly important as they use projects to deal with the increasing complexity of the environment. Organisations must be able to respond to unexpected events, evolve and adapt to their changing environments. An organisational design that supports the management of complexity will enable an organisation to survive over the long term. The VSM is a valuable guide for organisational design in complex environments. The second element, problematisation, can be outlined as follows: Project-oriented organisations operate in environments of high complexity. Therefore, a cybernetic view is useful, and here, the VSM provides a systemic approach to managing this increased complexity while gaining insights into an organisation's future and survival capabilities. However, for the purpose of transfer and integration with regard to the concept of project-oriented organisations, the VSM was not focused on. Therefore, our working hypothesis, included as a third element, is as follows: project-oriented organisations can be related to the VSM, which improves the theoretical understanding of the same. The fourth element highlights our propositions, which show how the competencies of project-oriented organisations can be related to those of viable organisations. For the fifth element, the experiment, we invited other researchers to investigate the approach, i.e. the verification of the propositions, in an empirical study. This brought us closer to the last element: new practice. Our goal is to add a cybernetic perspective to research on project-based organisations and to complement research on the VSM by introducing competencies that express the VSM. Our work can complement the literature on viable systems by empirically applying and testing our concept of competencies of viable organisations.
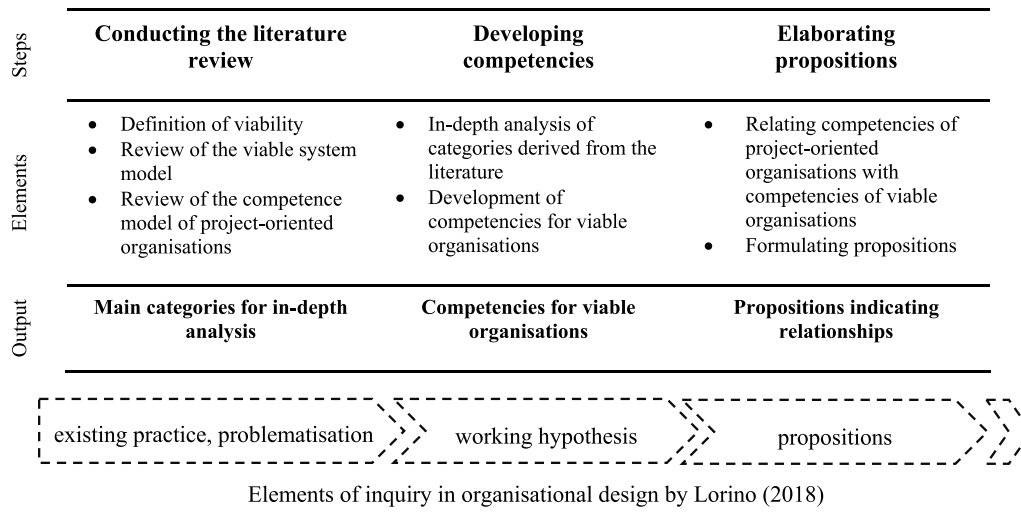
Steps	**Conducting the literature review**	**Developing competencies**	**Elaborating propositions**
Elements	• Definition of viability • Review of the viable system model • Review of the competence model of project-oriented organisations	• In-depth analysis of categories derived from the literature • Development of competencies for viable organisations	• Relating competencies of project-oriented organisations with competencies of viable organisations • Formulating propositions
Output	**Main categories for in-depth analysis**	**Competencies for viable organisations**	**Propositions indicating relationships**

existing practice, problematisation → working hypothesis → propositions

Elements of inquiry in organisational design by Lorino (2018)

Fig. 1. Research process.

4. Project-oriented organisations through the lens of viability

4.1. Reframing the viable system model

To reframe Beer's system-based model based on competencies, we will describe five systems based on our literature review and explain their functions to identify the competencies needed to design a viable organisation (see Table 2).

4.1.1. System One – operational function

System One (S1), the operational function, includes operational activities that work together in an integrated and harmonious manner to optimise the overall performance of an organisation (Peppard, 2005). This system encompasses the management of day-to-day operations. By fulfilling the overall purpose of the system, S1 is action oriented, unlike the others, which are responsible for the control and management

Table 2
The five systems of the viable system model.

VSM System	Purpose of the System	Description of the System
System One	*Operational function: operational activities*	• fulfilling the purpose with activities • interacting with the environment • operational activities that work together
System Two	*Coordination function: harmonisation of activities*	• using synergies to self-regulate • harmonising and coordinating activities • matching actual and potential systemic states
System Three	*Control function: managing and auditing operational units*	• auditing using information • managing operational elements and allocating resources • using synergies to self-regulate
System Four	*Intelligence function: communicating with the environment and planning for the future*	• examination of the environment to identify problems and opportunities • making sense of environmental changes • planning for the future
System Five	*Identity function: normative management*	• complying through governance and policies • conveying identity and values • meaningful balance of present and future requirements

functions. The people working within a viable system interact with the actors in the external environment to fulfil organisational purpose (Brocklesby, 2012; Chaudhry, 2022; Schwaninger and Scheef, 2016). This includes creating products that are needed to manage the variety in the organisation's environment (Lowe et al., 2020). The interaction with the environment, the interplay of activities and the improvement of self-regulation help the organisation remain viable and survive in an environment of constant change and growing complexity, while the fulfilment of the purpose with activities enables organisations to give meaning to the events that affect them.

4.1.2. System Two – coordination function

System Two (S2), the coordination function, ensures that the operational elements work together harmoniously (Brocklesby, 2012). This involves ensuring the stabilisation of operational systems through the coordination of information systems, operational plans and schedules, standards and communication (Chaudhry, 2022; Schwaninger and Scheef, 2016). S2 harmonises activities by providing common values and standards for information, communication and processes (Lowe et al., 2020). The tracking of information and knowledge is intended to dampen the oscillations between different system units (Leonard, 1999). S2 enables the required variety in coordination with its environment to achieve current and potential system states (Brocklesby and Cummings, 1996). In this regard, the more coordination and harmonisation that occurs in an organisation, the more self-regulation is possible (Espejo, 2003). The harmonisation of activities helps the organisation adapt to actual and potential systemic conditions while improving self-regulation. This enables the organisation to perceive and survive changes in its environment.

4.1.3. System Three – control function

System Three (S3) is responsible for performing the day-to-day management and administration of resources, employees and finances (Brocklesby, 2012; Peppard, 2005). The allocation of resources is enabled through the review and use of information gathered through social activities and informal communication (Schwaninger and Scheef, 2016). S3 has an audit function for the ad hoc collection of information from operational elements to ensure goal achievement (Chaudhry, 2022). This also involves monitoring the essential variables to avoid excessive variety (Leonard, 2009) and supporting the self-regulation of the operational units (Lowe et al., 2020). Managing the operational elements and allocating resources by leveraging information and synergies to self-regulate help organisations quickly understand and respond to changes in their environments.

4.1.4. System Four – intelligence function

System Four (S4) refers to planning and focusing on the future by examining the environment. This involves evaluating the strategic opportunities, threats and future directions as a way of responding to changes in a dynamic and changing environment (Bititci et al., 1999; Brocklesby, 2012; Peppard, 2005). The environment is examined through analyses of customer preferences, the assessment of technological advances and the identification of requirements. This improves the understanding of changes in the natural, social, economic, technological and political environments (Leonard, 2009). By simulating the necessary adaptations and integrating people, infrastructures and innovations, plans for the future can be developed (Leonard, 1999). S4 addresses the system as a whole and considers its purpose (Brocklesby and Cummings, 1996, p. 1; Lowe et al., 2020). Examining the environment to identify problems and opportunities, as well as planning for future readiness, helps organisations manage the future and make sense of environmental change.

4.1.5. System Five – identity function

System Five (S5) provides a link to the other systems in determining the organisation's raison d'être (Brocklesby, 2012). It monitors the balance between long-term actions (S4) and short-term actions (S3), that is, the balance between a present and future orientation (Dominici and Palumbo, 2013; Peppard, 2005; Schwaninger and Scheef, 2016). This balance serves to create meaning through strategies and manage the coherence of established strategies (Espejo, 2003). This occurs in compliance with the laws and regulations imposed by a higher-level system (Esmaeil Zadeh et al., 2014). The balance between day-to-day demands and the future is overseen by normative management functions and defines the identity of the system (Leonard, 2009). Here, ethos, values and cohesion are communicated, resulting in the creation of a corporate identity (Chaudhry, 2022; Lowe et al., 2020). The balance between exploring and exploiting information serves as a key factor in the survival of an organisation. The conveying of identity and values brings about a meaningful balance between present and future requirements.

4.2. Competencies of viable organisations

The competencies that are required for an organisation to be viable can be described through three dimensions: *sense-making*, *survivability* and *futureability* (Table 3). In the following section, we outline how these dimensions have been described in the literature and how they are constituted from the perspective of the VSM.

4.2.1. Sense-making

In the literature, sense-making is described as the way organisations give meaning to the events that affect them; they constitute themselves through systems of meaning and social processes of sense-making (Weick, 1995). This active shaping of events has implications for organisational processes, including strategic change and decision-making, innovation and creativity and organisational learning (Maitlis and Christianson, 2014). Based on the VSM systems, we describe *sense-making* as the mediation of identity and values, the fulfilment of purpose with activities through a meaningful consideration of present and future requirements and, thus, the understanding of the meaningfulness of environmental change.

Sense-making is the communication of identity and values (Chaudhry, 2022). The social processes of sense-making mentioned by Weick are enabled by normative management functions (Leonard, 2009). *Sense-making* means looking at a system as a whole to enable an understanding of its raison d'être (Brocklesby and Cummings, 1996). Identity allows reflection on how the organisation identifies itself and through which elements this identity is lived to fulfil the purpose of the system (Brocklesby and Cummings, 1996). Furthermore, *sense-making* means eliciting a balance between the day-to-day requirements and the future (Leonard, 2009). The balance between present and future demands is achieved by monitoring long-term and short-term actions (Peppard, 2005). This creates a balance between the firm's present and future orientations (Schwaninger and Scheef, 2016). With this balance, the understanding of environmental changes, that is, in the natural, social, economic, technological and political environments, can be improved (Leonard, 2009). People working within a viable system interact with actors in the external environment, such as customers and suppliers, to fulfil organisational purposes, without which the achievement of the organisational purpose is not possible (Chaudhry et al., 2017).

4.2.2. Survivability

In its most basic form, survival is defined as continued existence, neither with the certainty nor expectation of eternity but with the hope of longevity (Olshansky et al., 2001). The literature has described the survivability of organisations as the ability to perceive changes in the operating environment, quickly grasp the impact of those changes and respond to them (Seville, 2016). March (1991) points to a balance between exploration and exploitation as a key success factor in a system's survival and prosperity, with exploration capturing risk taking and innovation and exploitation encompassing refinement, efficiency and execution. Based on the VSM systems, we describe *survivability* as the harmonisation and coordination of activities through the management of operational elements and allocation of resources to meet actual and potential systemic conditions, hence leveraging the synergies for self-regulation and compliance through governance and policy.

Survivability comes from the use of information from social activities and informal communication (Schwaninger and Scheef, 2016, p. 201), as well as the use of ad hoc information from operational elements, as is observed during audits (Chaudhry, 2022). The goal of using information is to manage operational elements to conduct day-to-day operations and allocate resources, personnel and budgets (Brocklesby, 2012; Peppard, 2005; Schwaninger and Scheef, 2016). Management is supported by the laws and regulations imposed by a higher-level system (Espejo, 2003; Esmaeil Zadeh et al., 2014). Such support helps to harmonise and coordinate activities, that is, to ensure that operational elements work together harmoniously and that operational systems are stabilised (Brocklesby, 2012; Lowe et al., 2020). Thus, operational activities work together in an integrated manner to optimise the overall performance, streamline daily operations and manage short-term actions (Peppard, 2005; Schwaninger and Scheef, 2016). This involves balancing actual and potential systemic states by tracking information to dampen the oscillations between different system entities and coordinate their activities (Leonard, 1999). This harmonisation helps elicit a high number of possible states and achieve the required variety (Brocklesby and Cummings, 1996; Yang and Yen, 2007).

Leveraging synergies enables some self-regulation by gaining

Table 3
Competencies of viable organisations.

Sense-making	Survivability	Futureability
Making sense of variety:	Harmonising and coordinating:	Interacting and analysing:
• making sense of environmental changes (S4)	• managing operational elements and auditing them (S3)	• interacting with the environment (S1)
• meaningful balancing of present and future requirements (S5)	• complying through governance and policies (S5)	• identifying problems and opportunities in the environment (S4)
Defining purpose:	Transforming and changing:	Being ready for the future:
• conveying identity and values (S5)	• matching actual and potential systemic states (S2)	• planning for the future (S4)
• fulfilling the purpose with activities (S1)	• implementing the transformation of the organisation (S2)	

information from operational plans and schedules, standards and communications and other information systems (Espejo, 2021; Lowe et al., 2020; Schwaninger and Scheef, 2016). The more coordination is enabled, the more opportunities are created for self-regulation (Espejo, 2003).

4.2.3. Futureability

In the literature, *futureability* has been viewed as the challenge faced by future management of maintaining organisational competitiveness and productivity through structural design and creative approaches to work assignments (Offermann and Gowing, 1990). *Futureability* is the capability of an organisation to compete in terms of both mature and emerging technologies and markets in which flexibility, autonomy and experimentation are required (O'Reilly and Tushman, 2013). In project-oriented organisations, the future is enabled by projects (Huemann and Silvius, 2017), which serve as vehicles for change (Marcelino-Sádaba et al., 2015).

Based on the VSM, we describe *futureability* as an examination of the environment to identify the problems and opportunities and the planning of future states. The future is captured by examining the environment to identify strategic opportunities, threats and future directions (Brocklesby, 2012). This helps detect changes in a dynamic and changing environment (Bititci et al., 1999). The environment can be captured by mapping customer preferences, technological advances and skill requirements (Chaudhry, 2022; Schwaninger and Scheef, 2016). Planning and aligning the organisation for the future are carried out by examining the environment to identify problems and opportunities (Peppard, 2005) and integrating people, infrastructure, innovations, products and future visions. This is accomplished through the intelligence function of viable systems, which considers the system as a whole, as well as its strategic opportunities, threats and future directions (Brocklesby and Cummings, 1996). This allows the necessary adaptations to be simulated and defined (Leonard, 1999). Thus, it is about the organisation's ability to exist in a dynamic and changing environment. If the organisation does not change, it will become 'old and stale' and eventually cease to exist; that is, it will not be viable (Bititci et al., 1999, p. 191).

5. Propositions to apply the viable system model to project-oriented organisations

In the following, we present three sets of propositions regarding how to apply the VSM to the competence model of project-oriented organisations using the previously elaborated viable competencies for the design of viable organisations (see Fig. 2).

5.1. Viable competencies that strengthen the project-oriented dimension structure

In the *structure* dimension of the competence model, we distinguish between three competencies: the creation of an organisational structure with clearly defined roles and governance principles (*organisation*); planning and controlling processes that recognise the need for information and supply the organisation with it *(planning and controlling)*; and coordinated IT infrastructure to support management by projects *(ICT systems)*. Applying a cybernetic lens to the competence model, we propose a set of propositions, as shown in Table 4.

Planning and controlling manifest themselves in developing a well-founded, long-term viable strategy, which is broken down to the project portfolio level because the strategy of a project-oriented organisation is realised through the entirety of its projects (Kopmann et al., 2017). A project-oriented organisation uses project, programme and project portfolio management as specific business processes. Business plans and their controls are the instruments used to manage such processes (Gareis and Huemann, 2007). Defining strategies and business processes relates to an organisation's ability to cope with the future (*futureability*), which
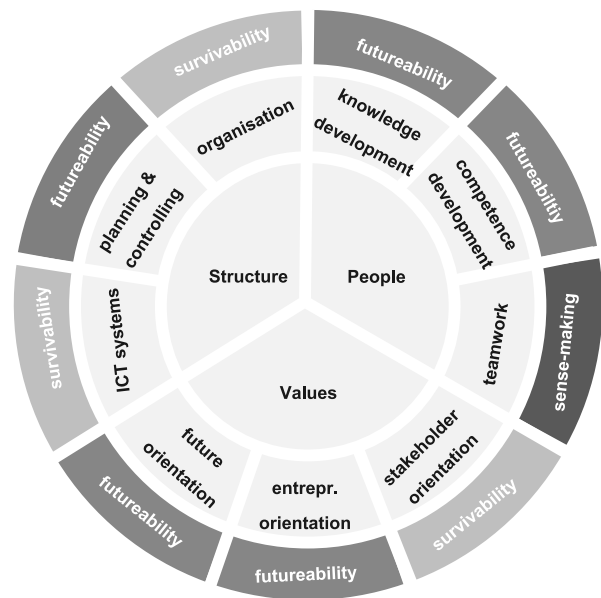

Fig. 2. Applying the VSM to project-oriented organisations based on competencies.

Table 4
Propositions regarding the structure competence dimension.

Propositions to strengthen the structure dimension
1. *Planning and controlling is mainly related to a viable organisation's ability to cope with the future (futureability)*
2. *Organisation is mainly related to a viable organisation's competence to survive (survivability)*
3. *ICT systems are mainly related to a viable organisation's competence to survive (survivability)*

indicates that considering strategic opportunities, threats and future directions leads to a viable organisational design (Brocklesby, 2012). In addition, *planning and controlling* relate to an organisation's ability to conduct research and development and strategic planning through which it explores new technologies and customer needs (Peppard, 2005). This helps envision the future and plan for and simulate necessary adaptations (Leonard, 2009).

ICT systems support decision-making for single projects and project portfolios and use strategies to plan, control and coordinate (Besner and Hobbs, 2012); they can have a positive impact on the success of the project portfolio and improve performance if organisations achieve a sufficient level of maturity in their project management processes (Kock et al., 2020). *ICT systems* help organisations increase their *survivability* because they support operational activities that work together in an integrated and harmonious fashion to optimise the overall performance (Peppard, 2005). These systems also help with the management of the basic units, optimising the day-to-day business (Schwaninger and Scheef, 2016) and ensuring that operational elements work harmoniously together (Brocklesby, 2012).

The *organisation* competence manifests the formalisation of project-related processes into different stages, which has been repeatedly shown to increase project portfolio performance (Beringer et al., 2013; Teller et al., 2012). This also entails a formalisation of roles, which increases performance. In particular, the roles of the project portfolio manager, the midlevel line managers and the project owners should be clearly defined (Huemann, 2016; Lehner, 2018). Hence, *organisation* is mainly related to *survivability* because it ensures that the operational elements work together harmoniously (Brocklesby, 2012). This enables the stabilising of operational systems, the handling of resources and the use of information and service management (Brocklesby, 2012;

Chaudhry, 2022; Schwaninger and Scheef, 2016).

5.2. Propositions to validate the values dimension of project-oriented organisations

In the *values* dimension of the competence model, we distinguish between three competencies: prioritising future success with regard to current success (*future orientation*); developing strategic processes for decision-makers to realise the organisation's purpose, support its vision and create competitive advantage (*entrepreneurial orientation*); and fostering the cooperation among internal stakeholders, who develop the project results, and cooperation with external stakeholders, who are the beneficiaries of projects (*stakeholder orientation*).

Applying a cybernetic lens to the competence model, we develop the propositions in Table 5.

Future orientation means that future success is prioritized with regard to current success. Such prioritisation aims at long-term goals and sustainable development (Maniak et al., 2014). Corporate foresight technologies, such as scenarios and road mapping, help connect strategic visioning with project portfolio management (Rohrbeck and Kum, 2018). When applying the competencies of viable organisations to project-oriented organisations, this competence is mainly related to a viable organisation's ability to cope with the future, namely its *future-ability*. This element of designing viable organisations entails considering strategic opportunities, threats and future directions (Brocklesby, 2012) by scanning the environment for change. This involves mapping customer preferences, technological advances and skill requirements (Chaudhry, 2022; Schwaninger and Scheef, 2016). Furthermore, it entails planning for the future by integrating people, infrastructure, innovations and products (Leonard, 1999).

Entrepreneurial orientation is the pursuit of innovation, aggressive entry into new markets and the acceptance of some degree of strategic risk (Miller & Friesen, 1983). It shows a willingness to introduce new things through experimentation and creative processes to develop new products, services and processes (Kock et al., 2021; Rank et al., 2015). We argue that this competence is mainly related to the *futureability* of viable organisations because it means that an organisation is constantly scanning its external environment to monitor any changes and arising demands so that the existing system may be adapted to the future needs of the environment (Leonard, 2009). This fulfils the intelligent function in an organisation that is necessary for adapting to a changing environment' (Esmaeil Zadeh et al., 2014).

Stakeholder orientation is aimed at achieving trusting and cooperative collaboration and communication with internal and external stakeholders. This is particularly important when dealing with conflicts, shaping management and encouraging teamwork. Kock et al. (2021) emphasise the relevance of sustainable relationships with employees, customers, suppliers, partners and other stakeholders. When applying the competencies of viable organisations to project-oriented organisations, this competence is mainly related to a viable organisation's *survivability*. Through stakeholder management, project professionals connect to the present environment and interact with the actors in the external environment for the fulfilment of organisational purpose (Chaudhry et al., 2017).

5.3. Propositions to validate the people dimension of project-oriented organisations

Regarding the dimension of *people*, we distinguish between three competencies. People work in teams on projects (*teamwork*) and learn how to work in project environments (*competence development*). They transfer their knowledge to other people and apply it to other projects (*knowledge management*). By applying a cybernetic lens to the competence model, we propose some propositions, as shown in Table 6.

Competence development can be achieved through learning. Professionals can learn with the help of human resource management activities. These activities contribute to higher emotional, managerial, intellectual and problem-specific skills, along with a better matching of project demands and personal competencies (Crawford et al., 2006). Human resource management helps assess the project requirements of different classes of projects and the different levels of competencies of project managers, which then form the basis of the project management career system (Crawford et al., 2006). We propose that *competence development* helps organisations improve their survivability. Thus, this competence is mainly related to a viable organisation's *ability to survive*. Espejo (2003) indicates that an organisation's ability to learn is improved when all autonomous units within the organisation are designed to exhibit these self-directing characteristics. *Competence development* may also be applied through the prevention of conflicts by providing shared values, languages, standards and protocols for information, communication and processes (Lowe et al., 2020).

Knowledge management can manifest itself through 'lessons learned', which are the most widely spread, especially in project contexts (Keegan and Turner, 2001; Mueller, 2015). The management of knowledge is about capturing information and sharing ideas, which enables the continuous creation of organisational capabilities and the realisation of increased average project performance in the future (Davies and Brady, 2000). *Knowledge management* can mainly be related to *sense-making*. Making sense of its surroundings refers to an organisation's capability to understand the changes in the natural, social, economic, technological and political environments (Leonard, 2009). This also entails the meaningful balancing of present and future requirements (Dominici and Palumbo, 2013; Schwaninger and Scheef, 2016), as well as forming connections with the other components and systems that can help determine the organisation's raison d'être (Brocklesby, 2012). This process considers the system as a whole and understands the purpose of its 'soul' (Brocklesby and Cummings, 1996, p. 199; Lowe et al., 2020).

Teamwork is the orchestration of collective cooperation (Greenwood and Miller, 2010), which positively influences the learning and performance of cross-functional project teams and is driven by leadership (Hoegl and Gemuenden, 2001). The quality of teamwork positively influences cooperation with other teams (Hoegl et al., 2004). *Teamwork* may mainly be related to an organisation's *futureability*. This entails the activities used to accomplish the system's purpose by interacting with the environment (Chaudhry, 2022), bringing together all the functions. A focus on the future is essential to the management of people and their work in teams (Leonard, 1999).

Table 5
Propositions regarding the values competence dimension.

Propositions to strengthen the values dimension
1. *Future orientation* is mainly related to a viable organisation's ability to cope with the future (*futureability*)
2. *Entrepreneurial orientation* is mainly related to a viable organisation's ability to cope with the future (*futureability*)
3. *Stakeholder orientation* is mainly related to a viable organisation's competence to survive (*survivability*)

Table 6
Propositions regarding the people competence dimension.

Propositions to strengthen the people dimension
1. *Competence development* is mainly related to a viable organisation's ability to cope with the future (*futureability*)
2. *Knowledge development* is mainly related to a viable organisation's ability to cope with the future (*futureability*)
3. *Teamwork* is mainly related to a viable organisation's competence to make sense of itself and its surroundings (*sense-making*)

6. Conclusion

In the present paper, we have deepened the theoretical understanding of project-oriented organisations and their design. We have added a new dimension to the competence model of project-oriented organisations by examining it from a cybernetic perspective. In doing so, we drew on the VSM, which is considered a guide for organisational design. To achieve our objective, we defined the competencies for designing viable organisations based on a semi-structured review of the literature regarding Beer's VSM. To this end, we reformulated the systemic view of the VSM and proposed competencies within the dimensions of *sense-making*, *survivability* and *futureability*. In the second step, we investigated the extent to which the competence model of project-oriented organisations might be related to viable organisations using our defined competencies. Consequently, we established three sets of propositions. Our paper contributes to the research in three ways. First, it advances the understanding of organisational viability by reducing its abstractness. Second, we improve the theoretical understanding of project-oriented organisations by proposing how the concept of viability can be applied to the competence model. In addition, we have contributed to the understanding of how companies can cope with the increasing complexity of their organisational environments by viewing their organisational designs through the lens of viability. This is significant because it will allow practitioners to reflect on the competencies of viable organisations and apply them in their specific organisational contexts. This will help equip them to meet the challenges they face in an increasingly turbulent and rapidly changing organisational environment.

In summary, the current paper has contributed to the discussion on a new approach to the analysis of project-oriented organisations. We have provided a better understanding of organisational viability through our research. In doing so, we have strengthened organisations' ability to be viable in the long term. Our objective was to make fundamental features and success criteria from cybernetics accessible to researchers in the field of project-oriented organisations and practitioners alike. Nevertheless, more research is needed to confirm our understanding of viability. Moreover, the research on viability could be reflected on through the lens of advances in terms of the VSM, such as the viable system approach, which provides a deeper focus on the interactions between a viable system and other viable systems (Dominici and Palumbo, 2013), or through recent developments in the systems perspective, such as complex adaptive systems (Daniel and Daniel, 2019). Furthermore, the propositions should be evaluated through empirical research.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

Appendix

Appendix 1. Literature Review on Viable Systems Model

Source		Viable System Model	Description	Competence
Brocklesby (2012)	S1	Operations (Integrating)	interacting with the environment	survivability
Brocklesby and Cummings (1996)	S1	Operations (Integrating)	fulfilling the purpose with activities	sense-making
Chaudhry et al. (2017)	S1	Operations (Integrating)	interacting with the environment	survivability
Chaudhry (2022)	S1	Operations (Integrating)	fulfilling the purpose with activities	sense-making
Lowe et al. (2020)	S1	Operations (Integrating)	operation activities that work together	survivability
Peppard (2005)	S1	Operations (Integrating)	operation activities that work together	survivability
Schwaninger and Scheef (2016)	S1	Operations (Integrating)	operation activities that work together	survivability
Brocklesby and Cummings (1996)	S2	Coordination (harmonisation)	matching actual and potential systemic states	survivability
Brocklesby (2012)	S2	Coordination (harmonisation)	harmonising and coordinating activities	survivability
Chaudhry (2022)	S2	Coordination (harmonisation)	harmonising and coordinating activities	survivability
Espejo (2003)	S2	Coordination (harmonisation)	enhancing self-regulation	survivability
Espejo (2003)	S2	Coordination (harmonisation)	enhancing self-regulation	survivability
Leonard (1999)	S2	Coordination (harmonisation)	matching actual and potential systemic states	survivability
Lowe et al. (2020)	S2	Coordination (harmonisation)	harmonising and coordinating activities	survivability
Schwaninger and Scheef (2016)	S2	Coordination (harmonisation)	enhancing self-regulation	survivability
Yang and Yen (2007)	S2	Coordination (harmonisation)	matching actual and potential systemic states	survivability
Brocklesby (2012)	S3	Control Function (Execution)	managing operational elements and allocating resources	survivability
Chaudhry (2022)	S3	Control Function (Execution)	auditing information	survivability
Espejo (2021)	S3	Control Function (Execution)	using synergies to self-regulating	survivability
Leonard (2009)	S3	Control Function (Execution)	auditing using information	survivability
Lowe et al. (2020)	S3	Control Function (Execution)	using synergies to self-regulate	survivability
Peppard (2005)	S3	Control Function (Execution)	managing operational elements and allocating resources	survivability
Schwaninger and Scheef (2016)	S3	Control Function (Execution)	managing operational elements and allocating resources	survivability
Schwaninger and Scheef (2016)	S3	Control Function (Execution)	auditing using information	survivability
Bititci et al. (1999)	S4	Intelligence Function (Planning)	examination of the environment to identify problems and opportunities	futureability
Brocklesby & Cummings (1996)	S4	Intelligence Function (Planning)	making sense of environmental changes	sense-making
Brocklesby (2012)	S4	Intelligence Function (Planning)	examination of the environment to identify problems and opportunities	futureability
Chaudhry (2022)	S4	Intelligence Function (Planning)	examination of the environment to identify problems and opportunities	futureability
Leonard (1999)	S4	Intelligence Function (Planning)	planning for the future	futureability
Leonard (2009)	S4	Intelligence Function (Planning)	making sense of environmental changes	sense-making
Leonard (2009)	S4	Intelligence Function (Planning)	planning for the future	futureability
Peppard (2005)	S4	Intelligence Function (Planning)	planning for the future	futureability
Esmaeil Zadeh et al. (2014)	S4	Intelligence Function (Planning)	examination of the environment to identify problems and opportunities	futureability
Brocklesby (2012)	S5	identity function (coherence)	meaningful balancing of present and future requirements	sense-making
Chaudhry (2022)	S5	identity function (coherence)	conveying identity and values	sense-making
Espejo (2003)	S5	identity function (coherence)	complying through governance and policies	survivability

(*continued on next page*)

(continued)

Source	Viable System Model		Description	Competence
Espejo (2003)	S5	identity function (coherence)	complying through governance and policies	survivability
Leonard (2009)	S5	identity function (coherence)	conveying identity and values	sense-making
Lowe et al. (2020)	S5	identity function (coherence)	conveying identity and values	sense-making
Peppard (2005)	S5	identity function (coherence)	meaningful balancing of present and future requirements	sense-making

Appendix 2. Literature Review on competence model of project-oriented organisations

Source	Competence model of project-oriented organisations		Description
	Dimension	Competence	
Maniak et al. (2014)	Values	Future orientation	future orientation means that future success is prioritized over current success
Beringer et al. (2013)	Values	Stakeholder orientation	stakeholder orientation aims at a trustworthy cooperation and communication in partnership with internal and external stakeholders
Covin and Slevin (1991)	Values	Entrepreneurial Orientation	innovativeness, pro-activeness, and risk taking
Kaufmann et al. (2020)	Values	Future orientation	following lineage principles improves project portfolio success
Kock et al. (2015)	Values	Entrepreneurial Orientation	investors engage in creating ideation portfolios and to invest additional money in order to exploit the created growth options
Kreiser et al. (2010)	Values	Entrepreneurial Orientation	exploitation of environmental opportunities and achievement of a company's objectives by any means necessary
Miller and Friesen (1983)	Values	Entrepreneurial Orientation	entrepreneurial firms pursue innovation, aggressively enter new markets, and accept a measure of strategic risk
Rank et al. (2015)	Values	Entrepreneurial Orientation	stakeholder involvement, strategic clarity, business case monitoring, and agility are success factors for project portfolio management
Rohrbeck and Kum (2018)	Values	Future orientation	corporate foresight technologies help to connect strategic visioning with project portfolio management
Beringer et al. (2013)	Structure	Organisation	the formalization of project portfolio processes into different stages has been shown repeatedly to increase project portfolio performance
Besner and Hobbs (2012)	Structure	ICT systems	ICT systems support planning, controlling, coordinating and decision-making for single projects and project portfolios increase performance
Gareis and Huemann (2007)	Structure	Planning and controlling	the project-oriented organisation uses projects as specific business processes and their control are instruments to manage such processes
Huemann (2016)	Structure	Organisation	a clearer formalization of roles also increases performance, i.e., the roles of the project portfolio manager, the mid-level line managers, and the project owners
Kock et al. (2020)	Structure	ICT systems	there is a positive impact of project portfolio management information systems' usage on project portfolio success
Kopmann et al. (2017)	Structure	Planning and controlling	as a future-oriented organisation requires that the organisation develops a well-founded long-term viable strategy
Kopmann et al. (2015)	Structure	Planning and controlling	planning and controlling has a significant positive effect on project portfolio success
Meskendahl (2010)	Structure	Planning and controlling	operational criteria allow to align the project portfolio with the organisational strategy
Prencipe and Tell (2001)	Structure	Organisation	establishment of clear rules and guiding principles at the decision points lead to data integrity and facilitate the comparison of projects
Greenwood and Miller (2010)	People	Teamwork	teamwork is the orchestration of collective cooperation
Crawford et al. (2006)	People	Competence development	learning is improved by human resource management in contributing to attracting, developing, recognizing, and retaining project leaders
Davies and Brady (2000)	People	Knowledge management	capturing and sharing lessons learned from projects are appropriate practice to enable the continuous creation of organisational capabilities
Hoegl and Gemuenden (2001)	People	Teamwork	teamwork quality positively influences learning and performance of cross-functional project teams and it is driven by leadership
Hoegl and Parboteeah (2003)	People	Teamwork	teamwork quality within a team positively influences the cooperation with other teams in multi-team projects and learning from them
Keegan and Turner (2001)	People	Knowledge management	among the structures and processes established for knowledge management in project contexts "lessons learned" systems are the most widely spread

References

Ashby, W.R., 1956. An Introduction to Cybernetics. Chapnm and U.
Beer, S., 1984. The viable system model: its provenance, development, methodology and pathology. J. Oper. Res. Soc. 35 (1), 7–25.
Beringer, C., Jonas, D., Kock, A., 2013. Behavior of internal stakeholders in project portfolio management and its impact on success. Int. J. Proj. Manag. 31 (6), 830–846.
Besner, C., Hobbs, B., 2012. Contextualization of Project Management Practice and Best Practice. Project Management Institute.

Bititci, U.S., Turner, T.J., Ball, P.D., 1999. The viable business structure for managing agility. Inter. J. Agile Manag. Sys. 1 (3), 190–199.
Boulton, J.G., Allen, P.M., Bowman, C., 2015. Embracing Complexity: Strategic Perspectives for an Age of Turbulence. OUP, Oxford.
Brocklesby, J., 2012. Using the viable systems model to examine multi-agency arrangements for combatting transnational organised crime. J. Oper. Res. Soc. 63 (3), 418–430.
Brocklesby, J., Cummings, S., 1996. Designing a viable organization structure. Long. Range Plan. 29 (1), 49–57.
Burgess, N., Wake, N., 2013. The applicability of the viable systems model as a diagnostic for small to medium sized enterprises. Int. J. Prod. Perform. Manag. 62 (1), 29–46.

Chaudhry, I., 2022. Viable system model: a tool for managing sustainable development holistically. Manag. Sustain. Arab Rev. 1 (1), 50–65.

Chaudhry, I.S., Espinosa, A., Vidgen, R., 2017. What Beer's theory of viability can offer to the field of workforce emotions. Int. J. Work. Organisat. Emot. 8 (3), 169–184.

Covin, J.G., Slevin, D.P., 1991. A conceptual model of entrepreneurship as firm behavior. Enterpren. Theor. Pract. 16 (1), 7–26.

Crawford, L., Hobbs, B., Turner, J.R., 2006. Aligning capability with strategy: categorizing projects to do the right projects and to do them right. Proj. Manag. J. 37 (2), 38–50.

Daniel, E., Daniel, P.A., 2019. Megaprojects as complex adaptive systems: the Hinkley point C case. Int. J. Project Manag. 37 (8), 1017–1033.

Davies, A., Brady, T., 2000. Organisational capabilities and learning in complex product systems: towards repeatable solutions. Res. Pol. 29 (7), 931–953.

Dominici, G., Palumbo, F., 2013. Decoding the Japanese lean production system according to a viable systems perspective. Syst. Pract. Action Res. 26 (2), 153–171.

Ellis, K., 1995. The association of systems thinking with the practice of management. In: Systems for the Future: Proceedings of the Australian Systems Conference, 17–22. Perth, Western Australia.

Esmaeil Zadeh, M., Lewis, E., Millar, G., Yang, Y., Thorne, C., 2014. The use of viable system model to develop guidelines for generating enterprise architecture principles. In: 2014 IEEE International Conference on Systems, Man, and Cybernetics (SMC), pp. 1020–1026.

Espejo, R., 2003. The Viable Systems Model: A Briefing about Organisational Structure. Syncho, Ltd, Lincoln, UK. https://www.syncho.com.

Espejo, R., 2021. The enterprise complexity model: an extension of the viable system model for emerging organizational forms. Syst. Res. Behav. Sci. 38 (6), 721–737.

Flood, R.L., Jackson, M.C., 1988. Cybernetics and organization theory: a critical review. Cybern. Syst. 19 (1), 13–33.

Gareis, R., 2005. Happy projects!: Project and programme management; project portfolio management; Management of the project-oriented organization; management in the project-oriented society; [new theories, models, best practices, case studies]. Manz.

Gareis, R., Huemann, M., 2007. Maturity Models for the Project-Oriented Company. The Gower handbook of project management, Turner.

Gemünden, H.G., Lehner, P., Kock, A., 2018. The project-oriented organization and its contribution to innovation. Int. J. Proj. Manag. 36 (1), 147–160.

Greenwood, R., Miller, D., 2010. Tackling design anew: getting back to the heart of organizational theory. Acad. Manag. Perspect. 24 (4), 78–88.

Hoegl, M., Gemuenden, H.G., 2001. Teamwork quality and the success of innovative projects: a theoretical concept and empirical evidence. Organ. Sci. 12 (4), 435–449.

Hoegl, M., Parboteeah, K.P., 2003. Goal setting and team performance in innovative projects: on the moderating role of teamwork quality. Small Group Res. 34 (1), 3–19.

Hoegl, M., Weinkauf, K., Gemuenden, H.G., 2004. Interteam coordination, project commitment, and teamwork in multiteam R&D projects: a longitudinal study. Organ. Sci. 15 (1), 38–55.

Huemann, M., 2016. Human Resource Management in the Project-Oriented Organization: towards a Viable System for Project Personnel. Routledge.

Huemann, M., Silvius, G., 2017. Projects to create the future: managing projects meets sustainable development. Int. J. Proj. Manag. 35 (6), 1066–1070.

Jackson, M.C., 1986. The cybernetic model of the organisation: an assessment. In: Trappl, R. (Ed.), Cybernetics and Systems '86: Proceedings of the Eighth European Meeting on Cybernetics and Systems Research, Organized by the Austrian Society for Cybernetic Studies, Held at the University of Vienna, Austria, 1–4 April 1986. Springer Netherlands, pp. 189–196.

Kaufmann, C., Kock, A., Gemünden, H.G., 2020. Emerging strategy recognition in agile portfolios. Int. J. Proj. Manag. 38 (7), 429–440.

Keegan, A., Turner, J.R., 2001. Quantity versus quality in project-based learning practices. Manag. Learn. 32 (1), 77–98.

Keegan, A., Turner, J.R., 2002. The management of innovation in project-based firms. Long. Range Plan. 35 (4), 367–388.

Kock, A., Heising, W., Gemünden, H.G., 2015. How ideation portfolio management influences front-end success. J. Prod. Innovat. Manag. 32 (4), 539–555.

Kock, A., Lehner, P., Gemünden, H., 2021. The project-oriented organisation: an empirical investigation of its impact on performance through driving promotors. In: EURAM 2021 Reshaping Capitalism for a Sustainable World, *Online Conference*, 16–18 June 2021.

Kock, A., Schulz, B., Kopmann, J., Gemünden, H.G., 2020. Project portfolio management information systems' positive influence on performance – the importance of process maturity. Int. J. Proj. Manag. 38 (4), 229–241.

Kopmann, J., Kock, A., Killen, C.P., Gemünden, H.G., 2015. Business case control in project portfolios—an empirical investigation of performance consequences and moderating effects. IEEE Trans. Eng. Manag. 62 (4), 529–543.

Kopmann, J., Kock, A., Killen, C.P., Gemünden, H.G., 2017. The role of project portfolio management in fostering both deliberate and emergent strategy. Int. J. Proj. Manag. 35 (4), 557–570.

Kreiser, P.M., Marino, L.D., Dickson, P., Weaver, K.M., 2010. Cultural influences on entrepreneurial orientation: the impact of national culture on risk taking and proactiveness in SMEs. Enterpren. Theor. Pract. 34 (5), 959–984.

Lehner, P., 2018. Promotoren und Kompetenzen projektorientierter Organisationen: Ein empirie-und theoriebasiertes Modell. Technische Universitaet, Berlin (Germany).

Leonard, A., 1999. A viable system model: consideration of knowledge management. Journal of Knowledge Management Practice 1.

Leonard, A., 2009. Integrating sustainability practices using the viable system model. Syst. Res. Behav. Sci. 25 (5), 643–654.

Lorino, P., 2018. Pragmatism and Organization Studies. Oxford University Press.

Lowe, D., Espinosa, A., Yearworth, M., 2020. Constitutive rules for guiding the use of the viable system model: reflections on practice. Eur. J. Oper. Res. 287 (3), 1014–1035.

Lundin, R.A., Arvidsson, N., Brady, T., 2015. Managing and Working in Project Society. Cambridge University Press.

Maitlis, S., Christianson, M., 2014. Sensemaking in organizations: taking stock and moving forward. Ann. R. Coll. Physicians Surg. Can. 8 (1), 57–125.

Maniak, R., Midler, C., Lenfle, S., Le Pellec-Dairon, M., 2014. Value management for exploration projects. Proj. Manag. J. 45 (4), 55–66.

Marcelino-Sádaba, S., González-Jaen, L.F., Pérez-Ezcurdia, A., 2015. Using project management as a way to sustainability. From a comprehensive review to a framework definition. J. Clean. Prod. 99, 1–16.

March, J.G., 1991. Exploration and exploitation in organizational learning. Organ. Sci. 2 (1), 71–87.

Merriam-Webster, 2021. Viability. Retrieved. from. https://www.merriam-webster.com/dictionary/viability. (Accessed 24 December 2021).

Meskendahl, S., 2010. The influence of business strategy on project portfolio management and its success—a conceptual framework. Int. J. Proj. Manag. 28 (8), 807–817.

Miller, D., Friesen, P.H., 1983. Strategy-making and environment: the third link. Strat. Manag. J. 4 (3), 221–235.

Mueller, J., 2015. Formal and informal practices of knowledge sharing between project teams and enacted cultural characteristics. Proj. Manag. J. 46 (1), 53–68.

Offermann, L.R., Gowing, M.K., 1990. Organizations of the future: changes and challenges. Am. Psychol. 45 (2), 95–108.

Olshansky, S.J., Carnes, B.A., Désesquelles, A., 2001. Demography. Prospects for human longevity. Science 291 (5508), 1491–1492.

O'Reilly, C.A., Tushman, M.L., 2013. Organizational ambidexterity: past, present, and future. AMPHIPACIFICA 27 (4), 324–338.

Prencipe, A., Tell, F., 2001. Inter-project learning: processes and outcomes of knowledge codification in project-based firms. Res. Pol. 30 (9), 1373–1394.

Peppard, J., 2005. The application of the viable systems model to information technology governance. ICIS 2005 Proceedings 5.

Rank, J., Unger, B.N., Gemünden, H.G., 2015. Preparedness for the future in project portfolio management: the roles of proactiveness, riskiness and willingness to cannibalize. Int. J. Proj. Manag. 33 (8), 1730–1743.

Rauch, A., Wiklund, J., Lumpkin, G.T., Frese, M., 2009. Entrepreneurial orientation and business performance: an assessment of past research and suggestions for the future. Enterpren. Theor. Pract. 33 (3), 761–787.

Rohrbeck, R., Kum, M.E., 2018. Corporate foresight and its impact on firm performance: a longitudinal analysis. Technol. Forecast. Soc. Change 129, 105–116.

Schoper, Y.-G., Wald, A., Ingason, H.T., Fridgeirsson, T.V., 2018. Projectification in Western economies: a comparative study of Germany, Norway and Iceland. Int. J. Proj. Manag. 36 (1), 71–82.

Schwaninger, M., 2001. Intelligent organizations: an integrative framework. Syst. Res. Behav. Sci. 18 (2), 137–158.

Schwaninger, M., Scheef, C., 2016. A test of the viable system model: theoretical claim vs. empirical evidence. Cybern. Syst. 47 (7), 544–569.

Seville, E., 2016. Resilient Organizations: How to Survive, Thrive and Create Opportunities through Crisis and Change. Kogan Page Publishers.

Simpson, J., Weiner, E., 1989. A New English Dictionary on Historical Principles (NED). Dates 1888 AA New.

Teller, J., Unger, B.N., Kock, A., Gemünden, H.G., 2012. Formalization of project portfolio management: the moderating role of project portfolio complexity. Int. J. Project Manag. 30 (5), 596–607.

Weick, K.E., 1995. Sensemaking in Organizations. SAGE.

Wong, G., Greenhalgh, T., Westhorp, G., Buckingham, J., Pawson, R., 2013. RAMESES publication standards: meta-narrative reviews. J. Adv. Nurs. 69 (5), 987–1004.

Yang, C., Yen, H., 2007. A viable systems perspective to knowledge management. Kybernetes 36 (5/6), 636–651.