Intelligent Organization Through the Lenses of Entrepreneurship and Project Management Approaches

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Abstract: The main research question of the paper is what is the concept of an intelligent organization as a critical area in the field of building modern socio-technological concept of organization with resiliency as its central feature. The research method is systematic literature review in the field of management and intelligent organization concept discussion in the light of entrepreneurship and project management research streams. The outcome of the research is the cybernetic and network based theoretical concept of intelligent organization. According to approach taken in the paper intelligent organization is revealing as the result of paradoxical process of effectuation and causation synthesis.

Key words: Intelligent Organization, Entrepreneurship, Project Management, Effectuation And Causation Synthesis.

1. Introduction

The purpose of the paper is to formulate a multidimensional concept of an intelligent organization in the light of the entrepreneurship and project management as two separate but also complementary management approaches. The intelligent organization area has been present in the management research literature for some years, but recently both the theoreticians and practitioners are more and more interested in this issue. Literature review shows that the roots of intelligent organization are located around the learning organization (Senge, 1997; Nonaka, 1991), very popular concept at the turn of the twentieth and the twenty-first centuries. Today, the growing importance of Industry 4.0 concept (Schwab, 2016) is changing qualitatively the learning organization concept towards complex, cyber-physical systems that are very often defined by an intelligent organization. Knowledge management and intellectual capital are two crucial aspects of learning organization area, however today it is strongly complemented by cyber-physical networks as pillar issues in the field of intelligent organization. Entrepreneurship and project management approaches, especially their combination, seems to be promising to explain the intelligent organization phenomenon. Entrepreneurship emphasizes the chaotic side of intelligent organization that is responsible for creativity, project management highlights the order side of intelligent organization that leads to its effectiveness. Explaining the phenomenon of intelligent organization authors based on a systematic literature review in the previously marked theoretical areas of entrepreneurship and project management. The following section of the paper is devoted to synthesis of research reports regarding the intelligent organization, both theoretical and quantitative/qualitative empirical studies. In the following section the concept of intelligent organization is briefly described in the light of entrepreneurship and project management. Finally, the paper regards the synthesis of entrepreneurship and project management theories as bases for intelligent organization concept.

2. Towards an Intelligent Organization Concept

Today companies face rapidly growing uncertainty and complexity, and therefore they are trying to evolve towards intelligent organizations. The most important features of intelligent organizations are adaptability and flexibility – the basic success factors in VUCA (volatility, uncertainty, complexity, and ambiguity) contexts. The intelligent organization concept is today very popular among consulting companies, especially information and technology (IT) based like SAP. According to this company "an intelligent enterprise is one that consistently applies advanced technologies and best practices within agile, integrated business processes" (SAP, 2023). These companies are offering various applications to help the enterprises to transform towards more intelligent ones in Software as a service (SaaS) platform business model. The most important solutions delivered by consulting companies on the way to transform towards more intelligent enterprise include (SAP, 2023): (a) sustainable business solutions, (b) business technology platform, (c) artificial intelligence, (d) business network, (e) industry cloud, (f) extended planning and analysis, (g) experience management, and (h) business process management. These applications are offered together with training and implementation programs. The abundance of different ready to use technology tools to support building intelligent organizations should be complemented by the

comprehensible theory of intelligent organization. The purpose of the paper is to formulate the multidimensional concept of an intelligent organization in the light of the entrepreneurship and project management as two separate but also complementary management approaches.

To discover the state of the art of theoretical knowledge on intelligent organization in management literature the Systematic Literature Review (SLR) according to Tranfield, et al. (2003) was carried out. According to Tranfield (2003) there are four main SLR stages: (a) planning the review (incl. identification of the need and protocol development); (b) identifying and evaluating studies; (c) extracting and synthesizing data (including conducting data extraction, conducting data synthesis); and (e) disseminate the review findings.

The SLR was conducted in April 2023 using the SCOPUS scientific database. The adjective smart as synonymous with intelligent was also included in the selection of the set of reviewed scientific articles.

The keywords used during the literature research were smart or intelligent organization, smart or intelligent enterprise and smart or intelligent business. In order to obtain the research outcomes strictly regarding the intelligent organization in management literature only articles with the keywords in the title and in the business, management and accounting theme were analyzed. The synthesis of SLR process and outcomes is presented in Table 1.

Table 1. The outcomes of SLR regarding intelligent organization concept

	Smart	**Intelligent**
SLR stage 1: The purpose	To recognize the "state of the art" on intelligent organization concept in management research literature	
SLR stage 2: Strings/protocols	TITLE("smart organization" OR "smart enterprise" OR "smart business") AND (LIMIT-TO (SUBJAREA,"BUSI")) AND (LIMIT-TO (DOCTYPE,"ar")) AND (LIMIT-TO (SRCTYPE,"j")) AND (LIMIT-TO (LANGUAGE,"English")) AND (LIMIT-TO (PUBSTAGE,"final"))	TITLE (*"intelligent organization"* OR *"intelligent enterprise"* OR *"intelligent business"*) AND (LIMIT-TO (PUBSTAGE , *"final"*)) AND (LIMIT-TO (DOCTYPE , *"ar"*)) AND (LIMIT-TO (SUBJAREA , *"BUSI"*))
SLR stage 2: number of articles without time range	24	18
SLR stage 3: The most common keywords listed according to the level of popularity (>=2 times)	Decision making (4), smart business networks (4), business networks (3), industrial management (3), big data (2), information technology (2), integrated model (2), intelligent agent (2), managers (2), marketing (2), smart business (2), smart organization (2), structural modeling (2)	Intelligent organization (3), organizational cybernetics (2)
SLR stage 3 and 4: the definitions in the most cited articles	Smart organization is knowledge-driven, internet worked and dynamically adaptive to new organizational forms and practices, it is learning as well as agile in its ability to create and exploit the opportunities offered (Khan, Halen, 2012) The basic networks of smart organization (Filos, 2005): - ICT networking (the internetworked, virtual organization) - Knowledge networking (dynamic interlinks of competence nodes) - organizational networking (agile flexible teaming)	Intelligent organizations are the ones that can learn how to create and innovate so as to improve the technical innovation capability (Alnuaimi, et al, 2021). The basic subsystems of intelligent organization are (Schwaninger, 2000): - the model for systemic control - the viable system model - and the team syntegrity model

The SLR on intelligent organization theory in management literature shows that this theory is at nascent stage and propose only attentive answers for main phenomenon (Edmondson & Mcmanus, 2007). Relatively small number of management research articles including whole phrases "intelligent organization" or "smart organization" in their titles shows that despite the popularity in consulting community the concepts are not well recognized in management science community. The need for building a consistent theory of intelligent organization as a synthesis of existing management research outcomes on intelligent and smart is obvious in the context that the number of management articles which titles include separate words intelligent and smart is growing very rapidly.

Smart organization is both internetworked (internally in the form of networks of teams and externally in the form of interorganizational network) and knowledge driven (codified and personalized knowledge). Three crucial

networks of smart organization are: ICT virtual cooperation networks, knowledge networks consisted of three contexts, i.e., business model, project teams and knowledge base, and organizational network base on agile teams principles. Smart organizations create ecosystems based on interorganizational relationships (Kordel, 2010). The smart organizations consist teams that are linked via ICT-enabled business processes between individuals and teams inside or outside the organization. According to Matheson and Matheson (2001) the highly smart organization has almost five times the chance of being a market leader than the counterparts. The nine principles, grouped according to three dimensions of smart organization are following Matheson and Matheson (2001): (1) achieve purpose, including value creation culture, creating alternatives, and continual learning; (2) understand the environment, including embracing uncertainty, outside-in strategic perspective, and systems thinking; and (3) mobilize resources, including disciplined decision making, alignment and empowerment, and open information flow.

The most common keywords connected with smart organization research are decision making and smart business networks. Smart organization is based on smart decision making which is based on Internet of Things (IoT) and Artificial Intelligence (AI). A large amount of IoT sensor information is gathered by IoT devices, and devices are connected to each other through IoT communication technology. The Artificial Intelligence of Things (AIoT) system, which uses the internet to exchange and transfer data, send commands and instructions to the device, and then conduct prediction and decision-making using artificial intelligence (AI) following big data analysis (Kuo, et al, 2022). Smart business networks are a dynamic, unpredictable web of individuals and companies that work together to produce smart results by quickly (re)configuring linkages between participants (Vervest, et al, 2004).

Coping with complexity is at the heart of intelligent organizations. The most common keyword connected with intelligent organization research is organizational cybernetics. From a cybernetic perspective, an organization's intelligence encompasses the following capacities according to Schwaninger (2000): (a) adapt to changing circumstances, (b) influence and shape its environment, (c) if necessary, to find a new domain or to reconfigure itself with its environment, and (d) contribute to the sustainability of the larger wholes into which it is embedded.

A framework for the design of intelligent organizations is consisted of three organizational cybernetic models according to Schwaninger (2000): the model for systemic control, the viable system model, and the team syntegrity model. In accordance with the model of systemic control different organizational effectiveness criteria apply at the three logical levels of management: (1) at the operational level, productivity, quality, and profitability are some examples of efficiency criteria; (2) effectiveness in both a cooperative and competitive (i.e., coopetitive) meaning is crucial at the strategic level (the best is being unique and have sustainable competitive advantage or in the ideal situation having no competitors at all; (3) legitimacy is defined at the normative level as possessing the capacity to uphold the claims of different stakeholders. The second, viable system model, is based on recursive organizational model consisted of autonomous parts. Autonomous units within autonomous units create a recursive structure. Additionally, a viable organization is composed of viable units, which are themselves embedded in more thorough viable units. The two models till now described deal with control and design issues. The third, the team syntegrity model is a structural framework for fostering cohesion and synergy in bigger groups of people or for encouraging the development of organizations with distinct identities from merely aggregates of people with similar interests (e.g., holacratic structures).

Synthesizing the existing knowledge, the intelligent organization should be described on the bases of network theory and cybernetic system theory. Using these two theories, the intelligent organization should be defined as a socio-technological knowledge driven network which is able to reconfigure together with the environment and to develop in the over average rate in the circumstances of uncertainty and complexity. Two overlapping, crucial dimensions of intelligent organization are internetworkness and cyberneticness.

3. Intelligent Organization in the Light of Entrepreneurship and Project Management Approaches

Entrepreneurship seems to be very promising in the field of intelligent organization development. The nature of entrepreneurship is based on commonly accepted by researchers concept of three dimensional entrepreneurial orientation (Rauch, 2009): innovativeness that reflects the tendency to adopt new practices and technologies and to go beyond the current state of knowledge, risk-taking which means the tolerance for uncertainty, and proactiveness that emphasize the initiative and ability to anticipate and pursue new opportunities (i.e., the first mover advantage).

Non-linear effectuation as an opposite to linear causation is the predominant logic of entrepreneurial thinking and entrepreneurial process (Sarasvathy, 2009). Entrepreneurs meet the universe of possible outcomes that can be created with the available means at their disposal and focus on continuous interactions with a committed network of stakeholders. Process of effectuation is consisted of following stages (Sarasvathy, 2009): (1) starting by asking oneself who you are, what you know, and whom you know; (2) limiting risk by calculating how much one can afford to lose; (3) embracing the surprise factor and trying to use it as a leverage; (4) reducing uncertainty by obtaining commitment from early partners; and (5) focusing on activities within one's control rather than trying to predict the unknown future. Entrepreneurship process is consisted of two crucial stages: opportunity identification/creation and opportunity exploitation (Shane & Venkataraman, 2000). Opportunity as a central category of entrepreneurship can be identified according to philosophical approach that reality is given or created according to philosophical approach that reality is constructed (Barney & Alvarez, 2007). The opportunity exploitation process means that a given set of resources should be configured in such a way that it creates the business model that is valuable for customers, rare comparing with competitors and costly to imitate by them (Alvarez et al., 2013). Technology entrepreneurship as a type of entrepreneurship construct that is rooted in innovation management and entrepreneurship and can be defined as process when development in science or engineering constitute a core element of the opportunity that enables the emergence of a venture, market, cluster or industry (Beckman, et al., 2012; Kordel, 2018). Technology entrepreneurship and technology opportunity as its central category seems to be crucial in the context of intelligent organization as socio-technological network (Kordel, 2021).

Popular methods created in the stream of entrepreneurship are discovery based planning (Cartolano & Pierantozzi, 2016), the lean startup (Blank, 2013), design thinking (Brown, 2008). The logic of discovery driven planning (Cartolano & Pierantozzi, 2016) method is following: uncertainty can be managed and reduced by systematically converting assumptions to knowledge and by redirecting its activities in the face of emerging understanding. Entrepreneurial process according to discovery based planning is consisted of following stages: (1) framing the desired business idea; (2) benchmarking the parameters that promise a successful outcome; (3) strategic translation of operations by specifying relevant organizational deliverables; (4) documenting, testing, and revisiting previously held or newly formed assumptions; (5) managing key milestones to reflect on actions taken and planning subsequent milestones; and (6) finding creative ways to run operations with a minimum amount of resources until major assumptions are tested. The most popular entrepreneurial tools in this method: reverse income statement, targeted experiments, and assumptions checklists.

The lean startup method is based on logic which is concentrating on eliminating the bottle-necks and in consequence shortening the process of startup building (Blank, 2013). This method favors experimentation over thoughtful planning, customer feedback over analyzing, and iterative design over design based on previously analyzed customer needs. The lean start up process includes three following steps: (1) reformulating a business idea into testable business model assumptions and building a minimum viable product, (2) testing the product with customers and objectively analyzing the results of the completed tests to validate the business model, (3) learning from the results and designing the next rounds of experiments. The crucial tools within this method are business model canvas, minimum viable product, key performance indicators and experiments.

The design thinking is a method for designers to use their creativity and methods of fitting people needs with what can be made possible by technology (Brown, 2008). Design thinking is based on iterative and human-centered practice based on user experience research. The process begins with defining the problem that given users experience, next understanding it deeply, and then creating a testable solution, the process ends with reflecting on the results Design thinking consists of five steps: (1) empathizing with the problem by understanding it from the users point of view, (2) formulating the users problem very deeply, in detail, (3) brainstorming different ways of solving the problem through generating a whole spectrum of possible solutions and combining insights about them, (4) prototyping a solution to highlight its strengths and weaknesses to identify new paths, and (5) testing the solution with users through soliciting feedback about prototypes to gain a better understanding. Design thinking offers tools such as empathy maps, value maps or user interviews.

Project management (PM) have increasingly become more relevant to organizations, regardless of the industry (Fernandes et al., 2020), especially in the context of intelligent organizations where they need to constantly learn how to create and innovate in order to enhance innovation capability (Alzoubi, 2021). Moreover since business has become project-oriented (Hobday, 2000; Martinsuo et al., 2006), it is crucial that intelligent organizations find the appropriate PM approach to support the governance of innovation and learning processes in the context that these intelligent organizations function. Since intelligent organizations have to frequently deal with complexity and uncertainty in the external environment, therefore project management can assist

intelligent organizations by bringing order and efficiency by defining a set of repeatable actions (Price Waterhouse , 2013).

Nevertheless, the value of PM is a function of what is implemented and how well it fits the organizational context (Cooke-Davies et al., 2009). PM approach is here defined as a high-level outline of guiding principles, perspectives, and characteristics of how a project is managed and governed (Špundak, 2014). A PM approach describes how a project will be managed and governed (Gemino et al., 2020).

General literature on PM presents different approaches varying in the level of flexibility and rigidness of the environment. For business environments where standardization of processes is valued and it is possible to clearly define projects characteristics in early stages, the waterfall approach (predictive or traditional approach) or process-based approach are suitable options (Project Management Institute, 2021). The waterfall approach is mostly used in environments where it is possible to plan in advance determining the scope, time, budget of the project, with a limited number of future iterations and changes in the initial plan (Fernandes et al., 2018; Project Management Institute, 2021), since the environment has a low level of uncertainty. The project-based approach is suitable for environments and organizations where their projects are similar to so processes can be normalized with small changes and adaptations from one project to other (Bravo et al., 2021). It is evident that in the context of intelligent organizations, relying solely on these two approaches is insufficient to effectively address the demands of high levels of uncertainty.

A less rigid PM approach that is commonly used is focused on results rather than process (Bravo et al., 2021). By doing so, organizations agree in advance on a set of indicators to measure results, in this way whenever monitors identify an event that can causes disturbance in future outcomes, a risk trigger is set, an pre-agreed plan is implemented without the need for a project team meeting to decide which actions to take (Gumz & Parth, 2007). Even though this approach allows organizations to be more active in relation to changes in the environment, it has a limitation, once it only works in environments where there is a low level of uncertainty and it is possible to have accurate predictions of future scenarios, which is not the case of intelligent organizations.

The agile approach (adaptive approach) is most useful when requirements of the project are very volatile and there is a high level of uncertainty in the environment (Project Management Institute, 2021; Serrador & Pinto, 2015). Agile approach works with iterative cycles, which at the end of each iteration the project evolves and the requirements are reviewed and depending on the environment changes or the occurrence of unexpected events the requirements are adapted (Project Management Institute, 2021).

Changes may sometimes lead to conflicts among collaborators. In agile PM, the scope of the project is defined and approved before each iteration. Several agile frameworks have been studied and developed such as the Scrum (Santos et al., 2016), Kanban (Flora & Chande 2014); Dynamic Systems Development Model (Agile Business Consortium, 2014), eXtreme Programming (Flora & Chande, 2014), and Crystal (Cockburn, 2004). Serrador and Pinto (2015) demonstrated a positive co-relationship between agile use and project success. However, other research argues for a combination of traditional and agile approaches (Gemino et al., 2020; Špundak 2014). One must value the specificities of each approach and, if possible, work with both at the same time, the called hybrid PM approaches.

Finally, there is the hybrid approach, which combines elements from both predictive (more rigid approaches) and adaptive approaches (more flexible) making it possible for project teams to use the adaptive approach to deal with the uncertainty elements from the project (innovation) and the predictive approach to handle the predicable elements of a project (standardized processes) (Fernandes et al., 2018; Project Management Institute, 2021).

The concept of an intelligent organization meets the current need for organizations to keep their radar on constantly changing environments and to remain competitive. This is largely due to the integration of all individual intelligence, as highlighted by the importance of this factor in the definition of intelligent organizations (Bratianu et al., 2006). Agile approaches, as defined by the PMBOK, are highly suitable and easily adaptable to projects characterized by high levels of uncertainty and volatility. Methodologies such as Scrum and Kanban are highly aligned with the concept of intelligent organizations. For instance, Scrum promotes iterative communication and collaboration among team members through frequent sprints, incentivizing participation in decision-making and facilitating the development of solutions to address challenges encountered during projects (Schwaber & Sutherland, 2020).

Kanban stands out as a highly suitable methodology, attending to the need for flexibility in intelligent organizations. According to the Kanban Guidebook, this methodology is focused on the continuous delivery of

value, which allows a quick response to changes in the environment and customer needs where aligns perfectly with the demands of intelligent organizations that need to quickly adapt to changes in the environment. In addition, the Kanban is highly visual, providing collaboration and teamworking within the workplace (Kniberg, 2010), thus promoting the integration of the intelligence of its members.

Cooke-Davies et al. (2009) argue that PM value is created or destroyed depending on the extent of fit or misfit between the organization's strategic drivers and the characteristics of its PM system. They criticize the unconditional use of PM standards and a misfit between specific project characteristics and the chosen management approach.

Engwall (2003) emphasizes the importance of a contingency approach and argues that projects are open systems dependent on history and organizational context. All different project types would benefit from a contingency theory perspective. Developing an intelligent organization in particular is comprised of highly heterogeneous activities and managerial conditions. Therefore, as König et al. (2013) argued, it is challenging to generalize PM practices, advocating instead for a contextual PM approach.

PM practices are the mechanisms by which PM processes are delivered and supported, and that, when managed effectively, can lead to project success (Barbosa et al., 2021) and consequently to an intelligent organization. This includes PM techniques (e.g., work breakdown structure or earned value management), various guidelines in which organizational processes are defined, including the use of procedure documents, checklists, job aids, and templates, as well as the use of software packages and various databases (Fernandes et al., 2013). Searching for tools and techniques is a tangible way to study PM practices because they represent how managers execute PM processes. They are also concrete and specific ways to apply rules and principles that must be selected according to the context of the organization where they fit (Besner & Hobbs, 2008). Tools and techniques are closer to day-to-day practice, closer to the things people do and closer to their tacit knowledge (Besner & Hobbs, 2006). Therefore, here PM practices are simply seen as those tools and techniques that practitioners use to 'do the job' and execute a PM process. Several investigations have identified the most used and useful PM practices (e.g., Besner & Hobbs, 2008; Fernandes et al., 2013; Tereso et al., 2019; Fernandes & O'Sullivan, 2023).

The summary of entrepreneurship and project management approaches according to five criteria: main attributes, traditional logic and stages of the process, the most suitable type to intelligent organization concept, example methods and the role in the context of intelligent organizations is presented in Table 2.

Table 2. Intelligent organization in the lights of entrepreneurship and project management approaches

	Entrepreneurship approach	Project management approach
Main attributes	Innovativeness Proactiveness Risk taking	Planning Monitoring/controlling & replanning Risk management
Traditional logic and stages of the process	Effectuation consisted of: - opportunity identification - opportunity exploitation	Causation consisted of: - identify causes - identify consequences
The most suited type of entrepreneurship and PM to intelligent organization concept	Technology entrepreneurship	Agile project management PM practices
Example methods	Discovery based planning Lean startup Design thinking	Scrum and Kanban
The role in the context of intelligent organization	Technology entrepreneurship can be supposed as effectual mechanism of building the intelligent organization	The Agile project management approach can serve as a strong foundation to manage the uncertainty inherent in an intelligent organization that is constantly undergoing changes.

4. Conclusions

The intelligent organization understood like in this paper as a socio-technological knowledge driven network able to develop in over-average pace in uncertain and complex environment can be described as the outcome of synthesis of entrepreneurship and project management approaches. Despite today, because of many methods formulated within the time frame of entrepreneurship seems to be more and more disciplined, in the nature of entrepreneurship is chaos and in consequence an effectual logic. The analogous but the opposite situation regards project management, today project management evolves towards more and more agile but in its nature is order and in consequence casual logic. Taking these two approaches under the umbrella of paradox management (Lee, 2016) can be promising in explanation of intelligent organization building process. The link

between entrepreneurship and intelligent organization is especially visible when emergence of this organization is becoming according to effectuation process. The link between project management and intelligent organization is clear when development of this organization is taking place according to causation process. Paradox management allows to join both processes of effectuation and causation and in consequence to explain the intelligent organization as an outcome of interplay between them (see figure 1.).

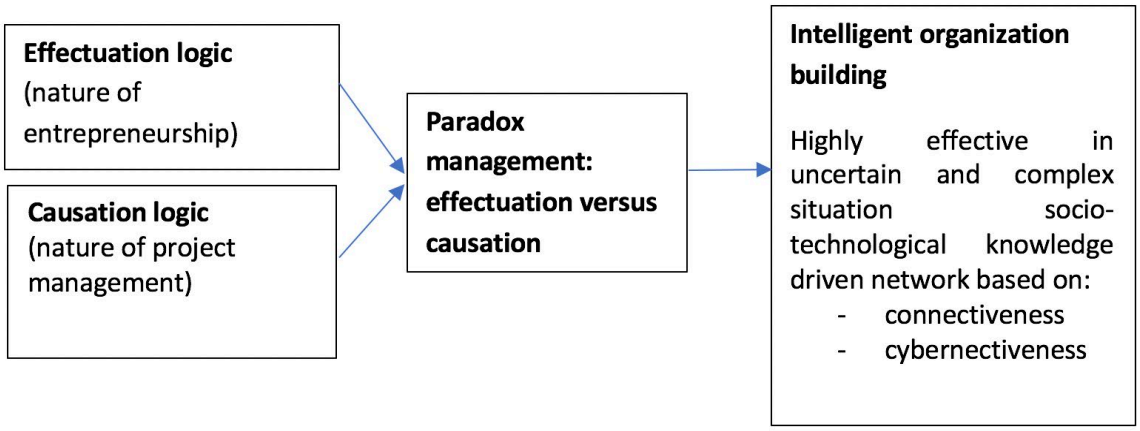


Figure 1. Conceptualization of the intelligent organization shaping as effectuation versus causation logic.

Based on our conceptualization of intelligent organization development as effectuation versus causation logic, we will adopt the process theory perspective proposed by Hernes (2007). Hernes argues that "process is constitutive of the world" (p. 44) and describes two perspectives on the process: technical, which focuses on processes, tools, and techniques, and social, which focuses on personal motivation and group dynamics. In our understanding of intelligent organization we are synthesizing this two perspectives. Following next work by Hernes (2007) we can classify the intelligent organization process as connectivity. According to this approach organization is seen as the unfolding of relations among heterogeneous units. In this context very promising in the field of intelligent organization explanation seems to be Latour's (1996) works in Actor-Network Theory.

As any research work this research also has limitations. This SLR gives a general overview rather than an extremely detailed account of findings due to the high number of articles reviewed. Thus, more specific research is required to carry out in-depth analyzes of each identified topic. Additionally, further empirical research is needed to better understand how intelligent organizations can maximise their benefits from the lenses of entrepreneurship and project management for its development.

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