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Business Ecosystem Strategy for Capital Industry: Transcending the Classical Project Management Amidst Complexity

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Abstract
The capital projects are executed with classical project management; overlooking the inter-organizational system approach of reciprocal relationships. This problem prompts a review of the business ecosystem strategy phenomenon capital projects, more so because it lacks research in this domain. The research questions are relating to classical project management concepts and limitations; business ecosystem and operating strategy actions; and strategy action patterns in capital projects. The paper shows that the ecosystems, in which the capital projects are embedded, are inter-organizational settings; invoking temporal permanence across the series of the projects. The ecosystem strategy concentrates on collaboration, innovation, and competition to create value and to sustain the systemic health and performance in a changing environment; while the project management approach remains around planning, executing, and control. Ecosystem strategy in projects broaches the holism and leverages upon the complexity of interdependence. The paper contributes to theory and practice by extending the macro view of projects and deploying the strength of interdependence. The ecosystem strategy phenomenon provides a paradigm to conduct positivist research; meeting the need for the systemic theorization of the inter-organizational aspects of capital projects, and balancing the need for advances in the development of theory and practical significance.
Keywords: Capital Projects, Project Management, Business Ecosystem Strategy, Complexity

Introduction

Projects are undertaken for value generation and represent an organization that has attenuated economic significance with ever-increasing scale, complexity, and magnitude (Steen et al., 2018). Capital construction which includes “real estate, infrastructure, and industrial structures is the largest industry in the global economy and accounts for 13 percent of the world's GDP” (McKinsey

& Company, 2020). Projects translate into the creation of "unique products, services or results" which have "social, economic, material or environmental utility" for a longer future (Project Management Institute, 2017; p. 4, 5); and thus, create something different with novelty and change. Describing philosophically projects are "means to make true what is possible" (Bocchi, 2012). The projects are executed with classical approaches of project management which consider the project as a temporary endeavor and transitory organizational form for reaching the goal within the limits of time and cost (Chih, Zwikael, & Restubog, 2019; Eriksson et al., 2019; Steen et al., 2018). The projects are not seen as an effective system with clear systemic logic; rather viewed as the whole equals the mere arithmetic sum of its parts (Varanini, 2012). However, the simplification of the projects like this in the complex project situation does not add to the effectiveness, more so because managing the project does not simply amount to a sum of its parts. (Varanini & Ginervi, 2012). The tools of classical project management are good enough to handle the complicated problems composed of linear relationships amongst the project component and participating entities. However, these classical project management models are inadequate to handle complex relationships having reciprocal influences (Paradiso & Ruffa, 2012).

Further, though the project is a system of systems, wherein every system influences the other and is influenced by them in an inextricably complex way, the application of the system approach to project management is not visible (Varanini, 2012). Today's complex projects, particularly in the capital industry, are embedded in the inter-organizational settings since multiple organizations participate and contribute to the delivery of the project, involving the ecosystem (Söderlund, Sankaran, & Biesenthal, 2017); however, the project management concepts overlook the inter-organizational facets of the projects (Sydow & Braum, 2018), and as a result, the inter-organizational collaboration for the construction projects has drawn lesser attention (Braum & Sydow, 2019).

Construction projects carry the record of poor productivity performance, more so because of lack of innovation compared to other industries (McKinsey Global Institute, 2017). There is a lack of systemic efforts to manage innovation in mega-construction projects. The projects are undertaken using classical tools of project management relying on the tried and tested techniques, established routines and proven technologies, using lowest price bid, transfer of risk to contractors, a freeze of design early, and following the original plan. This leads to avoiding innovation and novelty since these are linked to uncertainty and increased costs (Davies, MacAulay, DeBarro, & Thurston, 2014).

The best practices in classical project management are defined around the principles of project scope, work breakdown structure, base plan vis a vis actual status, and cost and schedule control and performance metrics, which are useful where the analytical approach is useful. However, when the project features are materially different and characterized by complexity, the tools for the project management are to be reviewed and redesigned, and integrated with the novel one in congruence with emerging project situations of the complex world. The limitations of classical project management and the underperformance of mega-projects call for looking for a different way of approaching the projects and refocusing tools and techniques. Further, there is a considerable body of research on how a single firm as a contractor or integrator

generate value for the stakeholders; however, less attention has been given to the creation of value by multiple actors collaborating for the megaprojects, though few studies are undertaken in the single project phase setting for restrictive network perspective (Lehtinen, Peltokorpi, & Artto, 2019).

This prompts the paper to look at the project as a business ecosystem, being a complex adaptive system, that provides a comprehensive lens for "considering reality as a whole", rather than the algebraic "sum of single parts" (Paradiso & Ruffa, 2012, p. 152). Construction project research the inter-organizational network perspectives of alliances, joint ventures and the like have been examined (DeFillippi & Sydow, 2016; Geraldi & Söderlund, 2018; Kusuma, 2014; Steen, et al., 2018). However, the business ecosystem perspective is distinct from the network perspectives since those include the wider constellation of firms including customers, and also those are not on the direct path of project execution (Adner, 2017; Shipilov & Gawer, 2020). As the value creation process in inter-organizational, mega construction projects is relational oriented and invokes complexity due to interdependence, it is essential to expand the research to include the other actors in the ecosystem for holistic aggregation (Chih, et al., 2019; Vargo & Lusch, 2017) and calls for research in capital projects with lenses of theories invoking complexity (Geraldi & Söderlund, 2018; Geraldi, Maylor, & Williams, 2011). Though there is recognition of the application of business ecosystem phenomenon to the capital industry (Pulkka, Ristimaki, Rajakallio, & Junnila, 2016); however, the research in this domain with business ecosystem strategy phenomenon is scant and deductive research is yet to begin (Javi & Kortelainnen, 2017) at the macro level of capital project studies (Geraldi & Söderlund, 2018).

With aim of addressing these empirical gaps arising from the limitations of the classical project management and theoretical gaps due to lack of deductive research in business ecosystem strategy phenomenon for capital projects, the article considers undertaking a literature review guided by the following research questions. First, what are the concepts of classical project management, and what are the limitations? This question leads to a review of classical project management theory and practice in application to capital projects. Second, what is the business ecosystem phenomenon, and what are the actions for strategy operations? This question directs to undertaking a review of business ecosystem theory and defining actions for operationalization of business ecosystem strategy. Third, what are the action patterns of the business ecosystem strategy in capital projects? This question aims at explicating the action patterns involved in the inter-organizational set-up of a business ecosystem in the context of the capital project. Fourth, what are the implications of the business ecosystem strategy construct in capital projects and agenda for future research? This question turns attention towards the considerations for future research propositions.

In summary, the present paper's objectives are fourfold: first, to critically review the past literature on classical project management and identify the limitation; second, to review the business ecosystem phenomenon and define the operational actions for the apropos business ecosystem strategy; third, to delineate the action regimes in the inter-organizational setting of the business ecosystem; and fourth, to provide explication for overcoming the limitations for the classical project management and conclude with developing an agenda for the future research.

Classical Project Management

Kerzner (2009) in his pioneering works describes that classical project management is concerned about, "the basic principles of planning, scheduling, and controlling work" (p. 75) and defined as "the process of achieving project objectives through the traditional organizational structure and over the specialties of the individuals concerned" (p. 56). The "Project Management Body of Knowledge" refers to the project as an algebraic sum of all the components, depicted in the work breakdown structure (WBS) (Paradiso & Ruffa, 2012). The classical project management approach, as espoused by the process group of PMBok, for "planning", "executing" and "monitoring and controlling" (PMI, page 39-65) focuses on: (i) Forecasting the future events and defining the actions to be implemented (planning); (ii) Verification of the consistency of the actual state with the forecast (control); and (iii) Managing the risks by forecasting the future event scenarios.

The major tool of WBS to define a project does not represent the world around it. It represents the components of the project; but not the reciprocal influences of the relationships. WBS does not identify the relationship between the activities, particularly those related to organization, convenience, and so on. The relationship that develops among the participating entities of the project is indeed "non-linear relationships"; that is, they are interactions that create mutual effects among the entities (actions and reactions), not just unidirectional shaping. Nonlinear relationships generate complex situations for both the interaction itself and the system as a whole. Ignoring these relationships in the model for the project would jeopardize the outcomes. Such neglect of the complexity emerging from interdependence hampers the utility of the model (Paradiso & Ruffa, 2012, p. 151).

Stakeholders are the joint partners involved in the project and entrust the resources and link their interests and expectations for the future outcome of the project endeavor (Varanini, 2012) and the project organization creates and retains the participation of these interest groups by considering and balancing their relevant interests (Aaltonen & Kujala, 2016).

Business Ecosystem and Strategy Actions

The business ecosystem phenomenon, having its pedigree in the systems thinking, has been invoked in the business contexts drawing a parallel with the natural ecosystem (Moore, 1993) as a strategy construct (Adner, 2017; Iansiti & Levian, 2004; Jacobides, Cennamo, & Gawer, 2018) and it is a complex system interdependent entity interact (Kapoor, 2018; Kapoor & Agarwal, 2017). The business ecosystem has complex organizational relationship patterns among the components of the system (Capra & Luisi, 2014) and represents an open boundary meta-organization with interdependence and interactions for mutual activities (Gulati, Puranam, & Tushman, 2012; Kapoor, 2018; Russell & Smorodinskya, 2018, Basole, et al., 2015) to accomplish system-level goals (Gulati, et al., 2012); and thus, such organizational form consists of "structure, function and process" (Lane, 2011). The entities of the business ecosystems are continuously engaged in the actions of collaboration, competition, and innovation (Moore, 1993; Kapoor, 2018), underlying the value proposition the focal firm offers to the user (Kapoor, 2018), with sustainable health performance (Iansiti & Levian, 2004; Den Hartigh & Van Asseldonk, 2004). A complex system invokes diversity in which all the components parts are adequately dissimilar for

the emergence of global properties (Varanini, 2012). The variety in a healthy business ecosystem helps to alleviate the collaborative complexity and complexity of participating organizations so that collaborating entities can develop the responses in situations of environmental uncertainty (Schneider, Wickert, & Marti, 2016). Following from this, the article adopts the operating definition of the business ecosystem, as "Business ecosystem is a holistic aggregation of interdependent entities, led by a focal firm, which aligns to a value proposition through collaboration and coevolves around an innovation, to attains competitive advantage for delivering value to customers and to sustain a healthy business ecosystem". Accordingly, the paper adduces the operational definition of business ecosystem strategy, as follows: "Business ecosystem strategy is ways in which the focal firm secures the holistic organization of partnering entities to accomplish activity configuration of collaboration and innovation to attain a competitive advantage over rival competing business ecosystems, and to sustains ecosystem health, in the changing environment".

Business Ecosystem Strategy and Action Patterns in Capital Projects

The project management process appears to be akin to the system; however, it differs fundamentally on various counts. As project management focuses on planning and control, it does not pay attention to the business ecosystem strategy. It assumes that the participants in the project recognize the role of the focal firm and are involved in the project knowing the ultimate objective to be accomplished. It misses recognizing the multilateral complementarities of products and systems provided by the entities in the business ecosystem (Adner, 2017). The projects have successors or predecessors. If the projects are part of a series, a lineage, or even a program, megaprojects have temporal embeddedness of the participating entities. As a result, projects are essentially more than a temporary system and represent the organization for projects. More than a mere network, the individual projects by themselves are embedded in the more durable and existing inter-organizational web, forming a systemic ecology, that is ecosystem (DeFillippi & Sydow, 2016). The business ecosystem phenomenon also gives a holistic view to the project stakeholder landscape "to consist of organizations and individuals that can affect or are affected by the project and of relationships among the organizations and individuals" (Aaltonen & Kujala, 2016).

The construction mega-projects are complex consisting of a variety of interrelated parts and project operations of these are characterized in terms of differentiation and interdependency through the involvement of several different organizations and firms suggesting the complex ecosystem (Kusuma, 2014). The project elements vary in the terms of types and quantity, having non-linear connections because of their reciprocal effect on each other. The complexity in construction emanates from several sources: resources employed, the environment in which the construction takes place, the level of scientific knowledge required, and the number of the interaction of different parts of the workflow. This complexity originates from the two distinct characteristics of the construction projects which are leading to interdependence: (i) "the organization of the production workforce into a variety of trades", and (ii) "the practice of subcontracting the portion of a project to a special trade contractor by primary contractors"(Dubois & Gadde, 2002). Following this, the project is considered as a

complex adaptive system with a comprehensive view of reality that evolves around the innovations (Paradiso & Ruffa, 2012).

Business ecosystem thinking accords critical importance to the component going into technological solution provided by the suppliers as well as complementary products, services, or infrastructure provided by the complementors (Kapoor, 2018; Piece, 2009). The business ecosystems entities involved in developing these complex solutions are suppliers, complementors, and system integrators; and in addition to these, may include distributors, advertisers, financiers, universities and research institutions, standard-setting bodies and regulatory authorities, the statutory bodies, and customers (Adner & Kapoor, 2010; Iyer & Davenport, 2008; Jacobides, Cennamo, & Gawar, 2016; Kandiah & Gossain, 1998; Makinen & Dehayir, 2012; Meyer, Gaba, & Colwell, 2005; Piece, 2009; Zacharakis, Shephard, & Coombs, 2003). The entities in the business ecosystem have two critical attributes, specialization and complementarity (Thomas & Autio, 2014). Capital projects need extensive complementary inputs and resources which match with the value proposition by the focal firm. Complementors are distinct from suppliers. Suppliers provide components going into business offering while complementors creates or enhances the value offering (Adner, 2006; Adner & Kapoor, 2010; 2016; Kapoor, 2018; Kapoor & Lee, 2012) with value output exceeding cumulative inputs (Autio & Thomas, 2014; Gawar & Cusumano, 2014; Lehtinen, et al., 2019). Specialization enhances innovation of a particular entity and operational performance that offers value creation avenues at the ecosystem level (Autio & Thomas, 2014). Complementarity helps the deployment of specialized resources and input at the ecosystem level and represents coevolution (Lehtinen, et al., 2019). Coevolution enables actors to provide more complementary but specialized inputs that increase the production of value in the business ecosystem (Moore, 1993).

With a high degree of specialization, firms are required to rely on the partnering entities to obtain those with collaborative arrangements. The distinct capabilities required for the construction projects are located at the level of the participating organizations in the business ecosystem which results in the interdependencies amongst the entities in the business ecosystem, and therefore, collaborative efforts led by the focal firm across the ecosystem becomes critical for the success of the project. The collaboration within the capital ecosystem becomes a critical asset to gain competitive advantage, due to the high content of inputs resources coming from complementors (Braum & Sydow, 2019; Dubois & Gadde, 2000; Shiu, Jiang, & Zaefarian, 2014). The collaborative dynamics in the business ecosystem allow the component firms to attain collective value and exploit the opportunities which are beyond the purview of the single firm (Bremner, Eisenhardt, & Hannah, 2017; Jacobides, et al., 2016; Rietveld, Schilling, & Bellavities, 2019). Collaboration provides a source of attaining competitive advantage of differentiation and cost leadership through resource and knowledge exchange (Dyer, 1996; Dyer & Singh, 1998; Barney, 1986, 1989; MacCormack, Forbath, Brooks, & Kalaher, 2007; Radziwon & Bogers, 2018; Zahra & Nambian, 2012). The business ecosystem strategy dwells upon the effect of the inter-organizational dependence and related issues on innovation growth. The viewpoint of the business ecosystem indicates that the businesses are rooted in the convergence of the organization, resources, and activities in which they collaborate to obtain access to resources they do not have for their sustenance. The focus of value generation has moved from firm to

business ecosystem (Adner, Oxley, & Silverman, 2013; Baldwin, 2012; Ceccagnoli, Forman, Huang, & Wu, 2012; Iansiti & Levian, 2004; Kapoor & Agarwal, 2017; Teece, 2007).

Changes through innovation inevitable in the complex adaptive system; cannot be eliminated, since such elimination will invoke the penalty of death of the system (Paradiso & Ruffa, 2012). Innovations entail the coevolution around value proposition, with collaborative and competitive interactions, aiming at delivering value to the customers (Peltoniemi, 2006; Iyer, Lee, & Venkatraman, 2006; Ritala & Almpanopoulou, 2017; Valkokari, 2015). Innovation is not a single firm offering, but as the result of collaborative efforts, as each firm contributes with its unique specialization. Such innovation will not affect an individual entity, but will also affect the entire ecosystem. The ecosystem of the focal firm, subcontractors, suppliers, and consumers plays a key role in innovation in the construction industry, as they are interdependent (Bygballe & Ingemansson, 2014). At the individual construction project level, the project participants have a "tight coupling" and a "loose coupling" at the permanent business ecosystem-level based on the collective adaption. In the business ecosystem, loose coupling provides a buffering mechanism against the adverse environment, so that the ecosystem as a whole will not respond to the changing environment (Dubois & Gadde, 2002; Weick, 1976). Such configuration provides avenues for the business ecosystem partners to satisfying individual project needs, simultaneously allows them to maintain flexibility (Ramlingam, Jones, Reba, & Young, 2008). The uniqueness, differentiation, and separation of the elements are maintained by the loose couples systems, and therefore, stimulate variety and innovations Following this, it is opportune for the focal firm to tighten the inter-project and inter-firm couplings (Dubois & Gadde, 2002).

There is competition within the ecosystem to draw self-profits for self and also there is an alignment on how the mutual, holistic organization supports the aggregate entity and gains an advantage over the rival ecosystem (Jacobides, et al., 2018; Hannah & Eisenhardt, 2018). Even if the business ecosystem entities are highly specialized and complementary, there are a range of entities providing inputs in the ecosystem or outside the boundary of the ecosystem. The alternative may have enhanced specialization or complementarity which would lead to competition within the ecosystem (Tiwana, 2015; Hannah and Eisenhardt, 2018), allowing each entity to capture value from the value created, and not consuming value at the cost of the other entity (Lehtinen, et al., 2019).

In line with systems thinking, the health of individual firms and the utility of their product is dependent upon the health and products in the ecosystem, so it is essential to envision collective, system health of the ecosystem (Iansiti & Levian, 2004; Den Hartigh, Vissacher, Tol, & Salas, 2013). Collaboration across the industries and between the companies is seen as a way to derive a competitive advantage from the business ecosystem. The health of interdependent firms is contingent upon the health of the business ecosystem as a whole and vice versa. Given this, the health and fitness landscape is more pertinent than the fitness of a single business entity in the ecosystem (Ramlingam, et al., 2008), and the capital project ecosystem, in general, is looking for positive measures for innovation, collaboration to enhance competitiveness and to improve the health performance (Cox & Thompson, 1997; Dubois & Gadde, 2002; Ramlingam, et al., 2008). The participants within the ecosystem co-evolve since they have to synergistically develop with other entities to sustain health in the changing environment; and it is a consequence of the need

to pursue continuously the specialization and complementarity in the evolving circumstances for mutual existence (Thomas & Autio, 2014).

Conclusions and Future Research Agenda

At the outset, this paper addresses the objectives to be a literature review on classical project management and its associated shortcoming; and further, to define the operating elements of business ecosystem strategy to establish its relevance in managing mega-capital projects amid complexity, going beyond classical project management. Table 1 provides a comparison of classical project management approach and business ecosystem perspectives. As set out in the objectives of this article, it offers the developing perspective of business ecosystem strategy focussed on securing an organization with an action-regime of collaboration, innovation, and competition to ensure financial and systemic health of the ecosystem. Further, the article describes, as summarized in Table 1, ways for going beyond the classical project management by adopting ecosystem strategy for complex projects for overcoming the limitations of the classical project management. The dynamics of the business ecosystem, with complexity, provides a cognitive model, as an alternative to the "mechanistic" view of the world and its shortcomings, to look the reality with a "comprehensive view". The logic is to apply with the quantum leap the "deeper and extended view of thinking, systematically trying to see everything as a whole and to be able to understand the system, the essence of its relations, and how to operate in an uncertain and unstable environment" (Giancotti, 2012, p. 82, 83). Classical project management views the organization as a basic framework, set in a stable environment and a forecasted future. The business ecosystem, a complex model of relationships and dependence, is based on the premise that an organization is an adaptive complex system, situated in a turbulent environment and an uncertain future (De Toni, 2012). Complexity in the business ecosystem is considered as a power of interdependence and thus it is no longer a problem but an advantage to leverage upon (Paradiso & Ruffa, 2012).

The operationalization of the business ecosystem strategy and associated action patterns dealt with in this article, being one of the objectives, opens up new avenues for deductive research in the context of complex capital projects. Such research will address the call for theory-driven research for projects (Rahimi, Kenworthy, & Balakrishnan, 2018) of the ecosystem in the wider context (Söderlund et al., 2017) at the macro-level (Geraldi & Söderlund, 2018). Noble Laureate for Physics, Robert Laughlin, observed that "science has moved from an Age of Reductionism to an Age of Emergence, a time when the search for ultimate causes of things shifts from the behavior of parts to the behavior of the collective" (2005, p. 208; cited in Comello, 2012). Business ecosystem strategy with its action patterns of collaboration, innovation, competition with health performance outcome provides a paradigm (Kapoor, 2018; Kuhn, 1970) to undertake positivist research; meeting the requirement of rigorous theorization of the inter-organizational dimensions (Sydow & Braum, 2018), at the macro-level of capital project studies balancing the need for advances in the theory and interaction with practice (Geraldi & Söderlund, 2018).

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