



A Fuzzy Model for Measuring Organizational Strategy Alignment: A Case Study on South Pars Projects of Iran's Oil Industry

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ABSTRACT

For every organizational and project activity, decisions should be made to delegate necessary resources. The objective of the current paper is to assist the oil and gas managers in aligning each functional level of strategy to make decisions on resource delegation. This can be conducted by creating a synergy which increases organizational performance. The methodology used in this research is based on a case study on Iran's South Pars oil and gas zone. The purpose of the present work is to find the alignment pattern classified on social structuralism domain.

This study is explanatory, qualitative, and developmental since it applies the fuzzy set theory to measurements. Presented herein is a comprehensive model according to the systematic and scientific approaches in the field of management. The main purpose of this model is to create organizational strategy alignment in severe environmental conditions and in the presence of external economic sanctions in South Pars oil and gas projects. The statistical society included in this study were the managers and CEO's who had in-depth experience in South Pars projects for more than five years. Since the number of the managers were 43, the possibility of data gathering allowed for not using the sample size. The results show that by increasing strategic alignment (SA) among strategy functions, structure, human resource, and technology, the level of organizational performance rises, and the fuzzy model of SA leads to better statement reality.

1. Introduction

Strategies are tools that organizations can use to achieve their strategic goals (David, 2008). According to some managerial theorists (Simon, 1957 and Mintzberg, 2007), not only are strategies about the organizational strategic goals, but they can create a behavioral pattern in the organization. It is clear that by the emergence of a strategy in behavior and by tracking the strategy in the organizational behavioral patterns, strategists can find a deliberate or emergent strategy pattern. In

any case, the goal of a strategy is to maximize all stakeholders' interests (Johnson and Scholes, 2005).

Regarding the status of an organization, different types of strategies may be prescribed for it, but the alignment among the elements of strategy can be considered as an effective way to improve organizational performance. While introducing concepts related to strategy, the purpose of this study is to explain the pattern of establishing strategy alignment in oil and gas organizations.

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Because the researchers believe that the alignment of organizational strategies improve organizational performance, a synchronization and performance model is proposed. Therefore, to introduce reality, it should be noted that there is an absolute harmony and a lack of coordination among strategies, so these extreme spectrums can be understood through the fuzzy analysis and measurements.

The problem from which the research has emerged is the cooperation and significant involvement of the different functional levels of strategy, and the alliance of this toward the environment will cause a better outcome for the oil and gas industry. The questions are as follows:

- 1- Is the alignment among structure, technology, strategy, and human resources give the CEO's the state that "the organizational elements are right and will be on the right track?"
- 2- Could the alignment cause the synergy in the organization and have a better outcome?
- 3- Among research improvement models, is there a model which improves the qualitative analysis of alignments with a quantitative source of data to give better states of reality?
- 4- What has happened in South Pars oil and gas projects as managerial decisions during the sanctions take effect?

2. The Concept of Strategic Alignment

The main issue of managing the organization is to align the strategy levels with the organization external environment (Mintzberg and Quinn, 1991; Pearce and Robinson, 1991, 1994; Hunger and Wheelen, 2007). Based on many theories of the coordination and integration of the organization, organizations which effectively align the structural factors with the strategic ones show higher effectiveness (Doty, Glick and Huber, 1993). Each of the existing systems at the organizational level of strategy must also align with its subsystems (internal alignment) as well as with its high-level systems and level systems (external alignment). Therefore, this leads to manifesting the management issue and creating directional synergies, thereby achieving the organization goals (Porter, 1985). Some of the strategic alignment theorists consider the alignment of the elements of the organization (structure, technology, culture, human resources, leadership style, and strategy) with environmental

conditions (Chorn, 1991; Leavit, 1965; Daft, 2004, Scott, 2002; Itami, 1987; Galbraith and Kkazanjan, 1986; Prahalad and Hamel, 1990; Barney, 1991), while others point to strategic alignment as the elements of the organization aligning with themselves (Woodward, 1965; Chandler, 1962; Andrews, 1987; Balkin and Gomez-Mejia, 1990; Dvir and Shenhar, 1993; Fisher and Govindarajan, 1990; Waterman, 1986). Strategic flexibility is the area in which the organization looks at a strategic capability to change the situation from one strategy to another so as to implement another strategy (Hunger and Wheelen, 2007). During the stability periods in the organization, new strategies are being developed and discussed. However, they maintain their organizational structures until it is time to execute them; the quantum leap is also required to implement strategies (Clarke, 2006). Therefore, strategic flexibility and the quantum theory of strategic change both need a change due to the dynamic alignment. In addition to explaining common patterns of creating strategic alignment in the organization, we will introduce a fuzzy alignment model.

3. Strategic Alignment Patterns

The main question is how the organization can establish a conceptual and strategic alignment. The practical and fundamental research into answering this question has created a new and emerging field incorporating the concepts, theories, and patterns of strategic management. The proposed patterns can be grouped into three types, namely rational, natural, and comprehensive patterns, which will be described in detail. According to the defects of each of these patterns, a new pattern called a fuzzy model is presented to measure the degree of strategic alignment.

3.1. Rational Patterns

Rational planning approach develops the strategy based on formal processes and rational decision making. In this approach, there is a one-way, top-down relationship between the level of the organizational strategy and the lower-level strategies. The lower level strategy is designed according to the organizational level strategy (although not entirely). It includes the goals, strategies, and policies for lower levels, which are

tailored to meet the organization goals. The strategy is like a cascade dropping from above, and, in the process of formulating strategy at the organization level, it addresses the organization needs and a strategy which refers to these needs (Bamberger and Biron and Meshoulam, 2014). The features of the rational model would be as follows. It can be queued even by considering all the factors with equal probability and by establishing a vertical alignment. Despite all the benefits of this model, one cannot ignore its limitations: idealistic and subjective, the requirement of a strategy to be the basis for work. Moreover, if the strategy is false,

the crafted strategy encounters the diversion as well as considering all practical obstacles. Therefore, other models are designed to respond to managers' needs to minimize these constraints.

3.3. Natural Patterns

Although theoreticians of rational systems associate organizations with components that have been gathered according to a plan and for specific purposes, the advocates of the natural system believe that organizations cannot be merely the only means of achieving certain goals. However, they are composed of social groups trying to adapt themselves to the specific conditions they are in (Scott, 2002). In this model, in addition to aligning the two levels of strategy, e.g. the corporate strategy and the business strategy, the effective dependent factors affecting both levels of strategy are also identified. The main advantages of this model include being objective and the real variables used in the model. However, complexity, difficulty, and a lack of stability in long run of native models are the main disadvantages. Therefore, based on strategic reference points and a fuzzy measurement model,

Flexible (Results)	Open	Radical	SRP2	The third types of theories and patterns		The fourth types of theories and patterns	
Control	System	Change		The first types of theories and patterns		The second types of theories and patterns	
Intense (Process)	Closed	Regulatory		SRP1			
			Burrell and Morgan, 1979	Objective	Philosophical assumption	Subjective	
			Scott, 1981	Rational	Attitudes	Natural	
			Hall, 1996	External	Focus	Internal	

Figure 1: Synonyms of reference points in categorizing management patterns according to Scott

Table 1- A summary of related theoretical perspectives

Theoretical perspective	Reference point emphasized	Fundamental prescription	Source
Motivation theory	Internal organization Individuals Groups	Design work and set goals for performance	Latham & Yukl (1975), Nadler & Lawler (1977), Hackman & Oldham (1980)
Resource-based view	Internal organization Firm-wide resources Capabilities	Build unique competencies	Wernerfelt (1984) Prahalad & Hamel (1990) Barney (1991)
Industrial economics	External condition Industry Key competitors	Beat the competition	Bain (1956) Caves (1977) Porter (1980)
Resource dependence	External conditions Suppliers Customers	Minimize constraints on resources	Pfeffer (1972) Pfeffer & Nowak (1976) Pfeffer & Salancik (1978)
Institutional theory	External conditions Stakeholders Interdependency	Meet the demands of society	Meyer & Rowan (1977) DiMaggio & Powell (1983) Mayer, Scott & Deal (1983)
Corporate identity	Time Past traditions Philosophy	The past shapes what is possible in the future	Westley & Mintzberg (1989) Torbett (1987) Dutton & Dukerich (1991)
Strategic intent	Time Long-term purpose Mission	Strategic intent informs current decisions	Hasegawa (1986) Imai (1986) Hamel & Prahalad (1989)

two general next patterns have tried to reduce these barriers of strategic alignment to a minimum.

3.4. Multipurpose Patterns (application of strategic reference point theory)

Different managerial theorists, based on their views, have considered specific points of reference such as cost reduction (Porter, 1985), quality (Imai, 1986), speed (Stalk and Hout, 1990), innovation (Foster, 1986), customer needs (Ohmae, 1988; Peters, 1987), and stakeholders (Handerson, 1990) for the success of organizations. If each of these reference points is emphasized, the organization will succeed. Table 1 represents multi-dimensional or combined strategic reference points used by some other theorists (Figenbaum and Schendel, 1996).

As summarized in the above table, each dimension is used as a reference point based on a theoretical philosophy from different theorists' viewpoints, and each dimension is explained to provide a specific purpose. All the measurements and choices are compared to the reference point, and strategic reference points are the targets and points of reference which managers use to assess options, to make strategic decisions, and to communicate the priorities of an organization to the key people of their system (Bamberger and Figenbaum, 1996). The organization selects strategic reference points to achieve strategic alignment or to perform appropriate actions and operations (Figenbaum and Schendel, 1996). In other words, strategic reference points are the points of alignment, and if they coordinate all the elements and systems of their organization, a comprehensive alignment will occur. Figure 1 shows the rational foundations of management theories (Scott, Burrell and Morgan, and Hall), which are synonymous with each other, and their reference points are consistent. To characterize the patterns of an organization systems and subsystems, one should select from the reference points referred to as "sustainable point of reference" and then attempt to identify strategy typology. This also applies to the typology of different strategies at each level of the strategy, namely corporate, business, and functional levels of strategy.

One of the major advantages of this model is the inclusion of an integrated and comprehensive model of strategic alignment in the organization. Furthermore, its problems are qualitative and

non-adaptable with quantitative variables such as performance, which will be expanded further.

4. Fuzzy Logic Model (An approach to the measurement of strategic alignment)

The classical approaches to the management world are rooted more in the two-dimensional logic and Aristotle's two values. It can be simulated to the real world which has only two dimensions: good or bad, right or wrong, truth or lie, black or white, life or death, guilty or innocent, zero or one, etc. (alignment or non-alignment). This principle encourages us to recognize the world and determine our place therein, and the transparency of our decisions depends on the clarity and transparency of our views (Grint, 1998). It seems that we have based our world on several dichotomies or two-dimensional contrasting spectra, which reduce complexity to an opposite pair.

In contrast, our language does not limit these two values, and it can describe the phenomena on a continuum. Hence, we not only have black and white, but also have gray, dark, light gray, etc. Organizations are fuzzy phenomena, and we define them in a state of being or not being. Therefore, if organizations are fuzzy, the issues related to them should then follow fuzzy patterns. On this basis, it can be explained that both strategic alignment and organizational performance can be categorized into fuzzy phenomena.

The basis of fuzzy logic or uncertainty in quantum issues can be searched. Bertrand Russell (1923), in connection with Aristotelian logic, explained the paradox of ambiguity and considered the procedure used to accept this logic as a habit. Heisenberg, in quantum physics, explained the "principle of uncertainty" to end the conclusion that scientific knowledge was cognitive, definitive, and certain. He showed that even atoms in the brain are uncertain. Heisenberg showed that, even in physics, the truth of propositions is based on a function of degrees (Azar, 2007).

Fuzzy logic shows that many aspects that were previously considered to be immeasurable can be measured. In fact, everything can be measured and evaluated, and this measurement and evaluation are fuzzy. What is proposed in the fuzzy strategic alignment model is to determine the degree of strategic alignment in a subject under study. Conversely, the criterion for evaluating words such as "aligned" and "non-aligned" depends on the individual's view. Therefore, we cannot even set an absolute rule for judging them, even

by doing endless tests (Tanaka,1996). Rahnavard and Nikzad (2010), in the study entitled “The Alignment between Organizational Elements” measured the strategic alignment based on a qualitative analysis of “proximity strategic types” by explaining a qualitative model for determining the degree of alignment in the light of strategic reference points.

The analytical model distinguishes the degree of alignment into three qualitative sections (high, medium, and low). In this study, the matrix of strategic reference points was divided into 256 parts (Figure 2). Moreover, based on “the degree of proximity,” the degree of alignment was analyzed qualitatively, and its relationship with organizational performance was measured. Since each dimension of the matrix of strategic reference points is divided into 16 parts; the adjacency of 1 to 64 is considered to be high, and the proximity of 64 to 128 is regarded as medium; from 128 to 256 is also defined as low proximity. This pattern takes into account the alignment in a domain of strategic reference points. Therefore, in this approach, the strategic alignment with the one-to-one correspondence in the strategic reference points matrix can be precisely investigated. On the other hand, the discrete matrix and adherence to Aristotelian logic are the main reasons for the bias in the analysis of the described model.

In the fuzzy pattern, at first, the matrix of the

strategic reference points is graded from 0 to 100. This grading will make the matrix of the strategic reference points more continuous (non-discrete). As a result, the dimensions of the matrix are separated into two dimensions, namely process control and outcome control, which respectively focuses on the internal environment and on the external environment; in this grading, four dimensions should be considered as follows:

- (1) The degree of outcome control;
- (2) The degree of process control;
- (3) The degree of focus on the internal environment;
- (4) The degree of focus on the external environment.

Each of these four dimensions will be graded from 0 to 100, so there will be a different matrix for grading on each side, which possibly assists with the rising control levels on each dimension (Figure 4). Based on the proximity theory in the continuous matrix of the strategic reference points, the distance from 0 to 71 is considered to be a high alignment, and the distance from 71 to 112 is regarded as a moderate alignment; the distance from 112 to 141 is defined as a low alignment. These limits are obtained by a mathematical relation between two points. According to this theory, the higher proximity (a short distance between the reference points) will cause a higher alignment. Using one of the two matrix dimensions (such as the degree of focus on the external environment and the

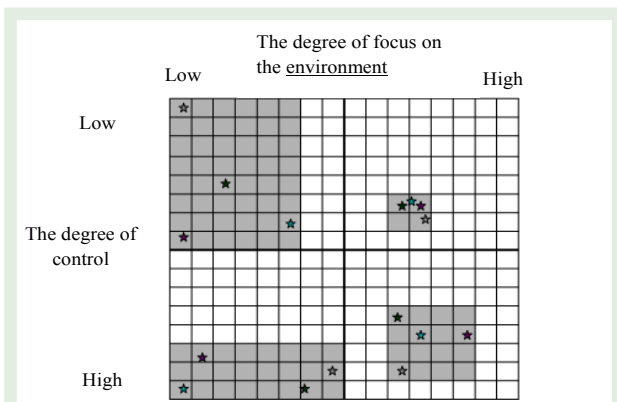


Figure 2: Matrix of discrete strategic reference points

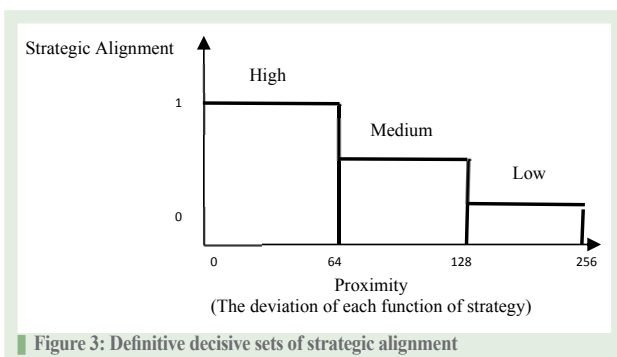


Figure 3: Definitive decisive sets of strategic alignment

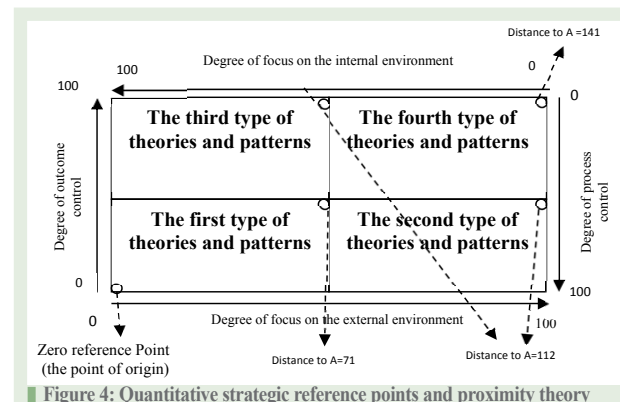


Figure 4: Quantitative strategic reference points and proximity theory

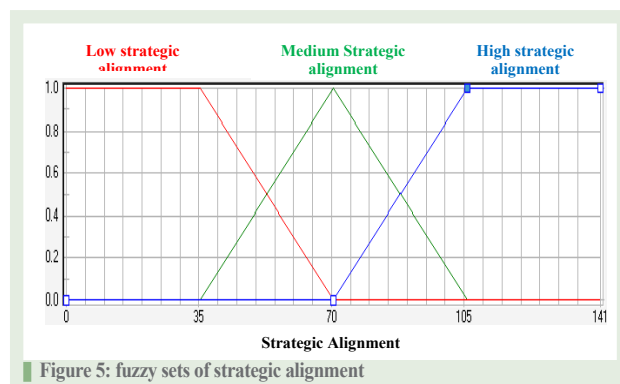


Figure 5: fuzzy sets of strategic alignment

degree of outcome control) is sufficient to determine the reference points. However, assessing the whole dimensions would raise the level of precision.

There is still ambiguity and uncertainty about the distribution of the related sets in the continuous proximity approach. For example, if the distance between two functional strategies was 55, the analyzers would assume that the alignment of these two functions belongs to the top set (high); this allocation is acceptable in terms of Aristotelian logic (Figure 3). In such a case, if, as an example, the deviation

of functional strategy is 55, the strategic alignment will then be high. However, this way of partitioning and the determination of an element allocation is different from our language and reality (linguistic world), a world where there is no complete certainty and fuzzy.

Fuzzy sets provide a framework for dealing with ambiguities. The overall framework to face ambiguity is “measures of fuzziness,” which is explained by the fuzzy set theory (Azar, 2007). Membership functions represent the functions of fuzzy sets and indicate, to what extent, an element is a member of a fuzzy set.

Table 2- The fuzzy degrees of most influential indicators of South Pars Projects Structure (according to the questioner completed in the phases)

Indicators	Phase 13	Phase 14	Phase 15-16	Phase 17-18	Phase 19	Phase 20-21	Phase 22-23-24	Indicator Average
Formalization	0.65	0.56	0.76	0.86	0.87	0.66	0.46	0.69
Specialization	0.91	0.82	0.75	0.88	0.89	0.76	0.82	0.83
Standardization	0.88	0.85	0.73	0.78	0.91	0.86	0.80	0.83
Hierarch of authority	0.71	0.87	0.87	0.90	0.93	0.67	0.71	0.81
Complexity	0.87	0.92	0.81	0.76	0.93	0.84	0.79	0.85
Centralization	0.81	0.83	0.87	0.71	0.75	0.87	0.82	0.81
Professionalism	0.63	0.87	0.67	0.64	0.82	0.76	0.78	0.74
Personal Ratio	0.72	0.58	0.72	0.62	0.81	0.52	0.82	0.68
Average of Structural Dimensions (Result Control)	0.77	0.79	0.77	0.77	0.86	0.74	0.75	0.78
Size	0.86	0.87	0.87	0.87	0.81	0.86	0.87	0.86
Organizational Technology	0.88	0.89	0.91	0.82	0.75	0.88	0.89	0.86
Environment	0.78	0.91	0.88	0.85	0.73	0.78	0.91	0.83
Goals and Strategies	0.90	0.93	0.71	0.87	0.87	0.90	0.93	0.87
Culture	0.76	0.93	0.87	0.92	0.81	0.76	0.93	0.85
Average of Contextual Dimensions (Ex-ternal Focus)	0.84	0.91	0.85	0.87	0.79	0.84	0.91	0.86

Membership functions make it possible to choose the degree of an element as a real number between 0 and 1 (Tanaka, 1996). Figure 5 represents fuzzy sets which are intertwined with the degree of the strategic alignment of functions in organizations. For example, if the rate of functions deviation is 55 units, the degree of strategic alignment is equal to 86 (= 141-55) units. In the fuzzy analysis, the strategic alignment is 37% high and 63% moderate .

The degree of strategic alignment is equal to the distance between functional strategy and the deviations of each range from the maximum distance of the matrix of the quantitative strategic reference points. In Figure 5, the maximum distance of the matrix of the quantitative strategic reference points is equal to 141.

Case Study

Management Structure of South Pars Projects: A Structure of the Other Organizational Elements

Herein, we investigate the whole projects of South Pars Oil and Gas Company (POGC) as a case study on a macro-project alignment of Iran’s Oil and Gas Industry. Accordingly, the alignment of the company’s functional departments will cause to obtain better findings on specific actual progress of the Project Management Body of Knowledge (PMBOK) areas and processes (PMI, 2016, Integration Chapter). The departments of each developmental phase, namely phases 13, 14, 15-16, 17-18, 19, 20-21, 22-23-24, are mostly managed by project managers of the site and the staff department, which are called the matrix structure. The labors, who work for those projects, are commanded by both the staff manager and the site manager simultaneously, which ignores the unity of command of Henri Fayol’s principles of management. Therefore, at this level of management, a huge amount of alignment and coordination should occur when the main specifics task is supposed to be done by contractors and sub-contractors. This duty of alignment of efficient knowledge areas is executed by the project management office (PMO) department

as the portfolio managing sectors of POGC. Table 2 tabulates the average result of structure indicators which led the decision-makers to a matrix according to strategic reference points (SRP). As listed in Table 2, there are two dimensions for determining the structure as a portfolio in a project, which are also useful for determining the organizational structure. The first dimension was associated with the structural dimension of that project, while the second one was related to the contextual dimension of a project. By assessing the whole South Pars projects and measuring them with fuzzy sets seen in Figure 5, the result shows that the average structural dimension is 78%. This means that the degree of the result control is characteristically high in Petroleum Ministry, National Iranian Oil Company (NIOC), and Pars Oil and Gas Company (POGC).

This measurement shows the level of formalization which indicates the degree of documents and forms required for managing the process of activities in the projects. The results confirm that the level of formalization is moderate (0.69), which might be due to the flexibility in making the activities most efficient by changing the management and the delegation of project CEO’s decision. However, the levels of specialization (0.83), standardization (0.83), the hierarchy of authority (0.81), complexity (0.85), centralization (0.81), and professionalism (0.74) are high, which states why the oil and gas projects are technically managed by basic design but have a high technology to construct and commission. Such characteristics do not need to focus on the process, but require to focus on the results.

The contextual dimensions of the phases implied that whether an organization agreed on the subjective points of view within that structure or not. The measurements show that all the South Pars gas field development phases have a high contextual dimension in structure (0.86). The size of social systems, as a subsystem of the manufacturing process, in every phase was mostly high (0.86). Because the phases were established during sanctions on Iran, a large number of factors surrounded the environmental situation (0.83). The goals and strategies for each mega-project are clear by schedules and objectives, and the culture, as the most influential thing, makes every hard task possible in sanction conditions. The culture has its in-depth effects on these phenomena. For example, new labors in the age range of 30 to 40 years having low experience with managing projects in normal conditions have a high potential

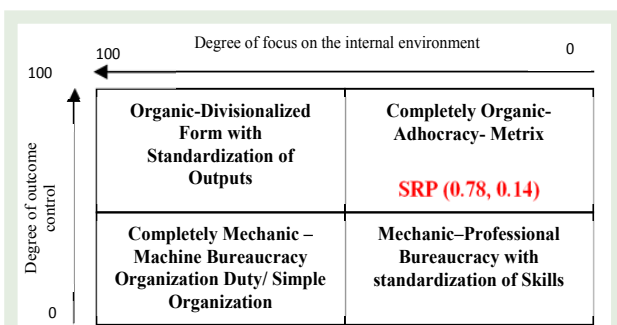


Figure 6: Structure strategy for the operation alignment of South Pars oil and gas projects

for making impossible things possible by renewing processes. All these contextual dimensions show a high external focus (low internal focus of 0.14) on performing something perfect for the gas field shared between Iran and Qatar.

By applying strategic reference point matrix along with the collaboration of quantitative assessment and proximity theory in Figure 4, the strategies of structure are presented in Figure 6 (Daft, 2015), and the operational structure which is better for executing those strategies is mentioned.

When the fuzzy-SRP was established, a better assessment of reality was achieved. All the organizational aspects should be aligned with the strategic reference points. This model should be aligned with organizational strategy, programs, human resource strategy, and technology strategy as displayed in Figure 7.

Figure 7 shows the alignment model for managing an organization or a project organization applied to the South Pars oil and gas phases (a portfolio). It is composed of the combination of 10 theories (David, 2018; Porter, 1985; Daft, 2015; Mintzberg, 2007; Bamberger, 1996; Woodward, 1965; Figenbaum, 1996; Rahnavard & Nikzad, 2012; Leavit, 1965) or philosophically more theories (Burrell & Morgan, 1979; Scott, 1957; Hall, 2001) to give the oil and gas decision-makers the chance to decide which elements of managing should be changed according to specified SRP's.

5. Conclusion

In South Pars oil and gas phases, the structure accepts the aggressive strategy of the gas field shared between Iran and Qatar to commission the developmental phases as soon as possible with a high priority. This structure is established truly and generates profits for the country. The matrix is aligned with the free agent (contractors/subcontractors)

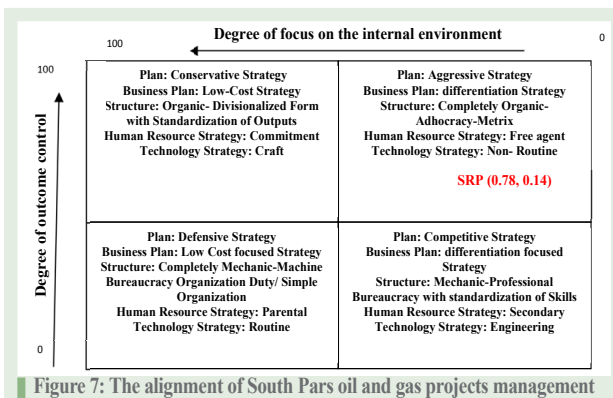


Figure 7: The alignment of South Pars oil and gas projects management

human resource strategy in which every subsystem of human resource supports the whole plan and structure simultaneously.

The core of the decision-making process in Pars Oil and Gas Company (POGC) makes all the processes of managing the portfolio non-routine because of Iran's external barriers and sanctions.

In the fuzzy pattern of strategic alignment, the strategies of the organization seek to determine the exact degree of alignment of strategy types. This method of analysis provides a clear explanation of the available contingency issues for the top executives to improve organizational performance by applying the aligned patterns. The current paper offers a more precise measure for the degree of strategic alignment based on the past researches related to the effect of strategic alignment on organizational performance; moreover, it is a link between performance and direct strategic alignment. By applying this criterion, the relationship between performance and strategic alignment can be determined more precisely, and it is clear how to assess the degree of strategic alignment.

By fuzzy methods, the chief executive managers in the oil industry will have a better understanding of the organization's goals and strategies. In fact, they will have a deep understanding of the goals and strategies chosen by various departments. Furthermore, they will realize that the main goal of this measurement attitude is to combine both theories and mathematical thinking to access the main alignment reality of the departments.

This study demonstrated that the main reason for synergy in POGC is because of the alignments of managerial elements and Iran's petroleum goals. That all the phases have been commissioned is the value of such recent performance.

This method can be applied to both upstream and downstream segments of the oil industry. However, the fuzzy set should be established again for each organization specifically. In fact, the fuzzy sets will not be the standard set for all organizations but will be a true applicable method for that segment of the oil industry.

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