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Modeling the Relationship between Business Process Reengineering and Organizational Culture

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Abstract: Business process reengineering (BPR) has been widely known for its effectiveness in generating chances for organizational improvement. Understanding and modeling the relationship between the factors that contribute to the BPR and organizational culture (OC) is critical for the success of its implementation. This paper introduces a fuzzy-based analytical hierarchy process, named FAHP, for integrating the factors affecting BPR with OC to ensure the BPR's success. First, a real case study was conducted to investigate the operational effectiveness and applicability of the proposed approach. Then, the BPR factors were validated and prioritized by a panel of experts from the American Society for Quality (ASQ) members network-Qatar chapter and a group of quality directors in Qatar. On the other side, the OC factors were investigated via a systematic literature review. Finally, an analytical correlation study was conducted to understand the relationship between the corresponding factors better. The correlation analysis study has shown that the organizational strategy, leadership, and transfer of knowledge are highly correlated with respect to people, innovation, and supportiveness. The team orientation, outcome orientation, and attention to detail factors have a medium correlation with the BPR factors. Moreover, the aggressiveness showed a weak correlation with all the BPR factors. The outcomes of this study provide decision-makers with guidelines for successful integration of the BPR and OC factors to ensure effective implementation of the BPR initiatives.

Keywords: business process reengineering; organizational culture; fuzzy analytical hierarchy process; business performance; competitiveness

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1. Introduction

Business process reengineering (BPR) as a management paradigm first emerged in the early 1990s [1–4]. It is common in the literature to define the BPR as a rethinking and radical redesign of a process to achieve a significant achievement in essential performance measures. These measures are mainly associated with the business process type. Examples of such measures are cost, quality, service, and speed [5]. Grover et al. [6] have introduced several points for defining the BPR. These are (1) involvement in a radical redesign of business processes, (2) using information technology to enable new business processes, and (3) achieving organizational-level strategic outcomes. Fetais et al. [7] conducted a literature review of BPR based on recent implementation measures.

Recently, the BPR has been considered one of the prime managerial approaches for business survival and increasing business competitiveness; nearly 80% of the previous BPR initiatives have failed to achieve expectations [8]. These failures can be considered a poor understanding of the BPR and its relationship with other factors affecting the nature of work and its environments, like the deployment of IT systems and organizational culture (OC) that supports the implementation. Practitioners who implement the BPR are unaware of the factors affecting a successful implementation. More than 65% of practitioners are still using the BPR. The literature shows that most studies on the BPR elements indicate different

types influencing its implementation. Unfortunately, these studies do not shed light on the intensity of influencing BPR implementation. These challenges practitioners to implement BPR successfully within their firms as they do not know where to focus. Many researchers have investigated the effectiveness of the BPR using multiple-criteria decision-making (MCDM) in several industrial and service sectors. However, to the author's knowledge, no study has utilized any MCDM approach to prioritize BPR elements for calculating their weights and guide practitioners. This paper aims to develop an analytical model for understanding the relationship between the BRP and organizational culture factors.

1.1. Business Process Reengineering Constructs

Al-Mashari et al. [9] and Paper and Chang [10] pointed out that most BPR elements/success factors have been extracted from the same pool, either from one source or a few articles. Thus, new studies must work on new definitions of BPR implementation constructs and success/failure elements. Nevertheless, there is a large number of studies in the literature that present a group of BPR implementation elements, including the following:

Farrell [11] explored four requirements for having a successful BPR initiative:

1. Consistency between the organization strategy and an understanding of its market, industry, customers and rivalries;
2. Leadership commitment to implementing new ways of running the business;
3. A business case founded upon proven analytical approaches;
4. A capable team to take the new concept into implementation.

Maull et al. [12] identified the following key issues underpinning a BPR initiative: (1) scope of changes; (2) strategy; (3) performance measures; (4) human factors; (5) business process architecture; (6) IT. Terziovski et al. [13] identified six BPR factors: (1) strategy, (2) management commitment, (3) information technology, (4) customer focus, (5) continuous improvement, and (6) performance outcomes. Moreover, Herzog et al. [14] stated that seven critical areas must be practiced to achieve successful BPR. The first critical area is the top management commitment, completely understanding BPR and how the institution can achieve it [15]. Jackson [16] stated that it is frequently cited as the most important tools to search for useful reengineering practices. Thus, the latter named this area levers and results. The third area is education and training. Al-Mashari and Zairi [17] indicated that researchers considered the technological infrastructure composition an important element of success. Armstrong [18] and Carr [19] indicated that the staff should be well trained in process mapping and brainstorming techniques. The fourth area is teamwork; as such, projects will require support from all business units and involvement from everyone. Although the success of BPR eventually depends on all departments' strong involvement at all levels in the institution, the dependency of the people who will do the work and how motivated they are is also an important factor [20,21]. Thus, the fifth is seen as important is employee cooperation. Another important is performing the BPR project thorough business needs analysis, assessing the current processes of eth institution and deciding what needs to be reengineered. The seventh element is IT support. Finally, BPR should align with strategic planning, where leveraging IT and digital transformation are addressed as a competitive tool [22–26].

Nkurunziza et al. [27] indicated that leadership is the main predictor of BPR success, while IT was not considered an element. Syed et al. [28] studied the telecom sector and specified thirteen critical success factors and did not consider IT as one of them. Other researchers like Zuhair and Ahmad [29] have a different view of IT; it is considered a core element of BPR success. Al-Anqoudi et al. [30] introduced a work where success factors, methods and tools of BPR are considered human, IT, and organizational elements. IT practice is part of the six identified constructs [31], along with the depth of BPR, change management, adaption to change, information management practice and information behaviors and values. Hashem [32] investigated the BPR success factors in the banking sector in Egypt and IT was one of them, along with management change, people management, change readiness, centralization, and formalization of the project.

Brandon et al. [33] collected 19 different constructs and presented them in five project phases in a study on the banking sector. Each construct affects a specific phase, allowing project managers to increase the success rates by phases. Hashem [32] concluded that the main six constructs are management commitment, IT infrastructure, people management, change readiness, centralization, and formalization. Hwang et al. [34] studied e-based supply chain management projects and identified fifteen factors in four dimensions: strategy, process, organization and technology. Finally, Asikia et al. [35] proposed a model of six elements: management change, management competency, organizational structure, BPR planning and management, and IT infrastructure. The model is a proposal to measure the effect of BPR efforts on performance.

1.2. Organizational Culture Factors

Schein [15] defined OC as a pattern of elementary assumptions that a group develops in a learning journey to cope with internal and external problems. *Armstrong* [18] defined OC as a group of values, norms, beliefs, attitudes and assumptions enunciated among a group but defined behaviors of the group within an organization. Values define the behavior of both people and organizations, where norms are unwritten rules of those behaviors. Moreover, Osborne and Kerry [20] define OC as a collection of attributes that influences how a group should behave to shared ideas, customs, assumptions, expectations, philosophy, traditions, mores, values, and understanding.

The organizational culture profile (OCP) assesses person-organization fit. The tool is employed in an organizational assessment regarding requirements for OC change, distinguishing subcultures and evaluating potential fit in mergers and acquisitions. The OCP tool consists of 54 value statements reflecting the seven factors: innovation, stability, respect for people; outcome orientation; supportiveness; detail orientation; Team orientation; and aggressiveness.

2. Research Objectives

This research work aims to develop an analytical model for understanding the relationship between the BRP and OC factors that anticipate the success of BPR implementation. Consequently, the research objective can be summed up as follows: (1) Quantify the relative correlation between the elements of the BPR and OC; (2) develop an analytical model to assess the success of the BPR initiatives under specific settings of the elements of organizational culture; and (3) evaluate the operational effectiveness of the proposed approach using a real-world case study in the State of Qatar.

3. Research Motivation

Researching why BPR projects have high failure rates is still a topic of interest to many researchers. Few studies in the literature review identified the BPR elements of a successful implementation project. Most empirical studies' results came in frequencies, categories of elements, or ranking of elements [8,10]. Few researchers proposed a conceptual model to study the relationships and correlation between elements [17,36–39]. They pointed out that most BPR elements studied in the literature review came from the same pool and thus most current BPR theories were built on the same elements. Some work is carried out to develop models and apply theories from other areas in the context of BPR. However, progress made to close this gap is not yet sufficient [39].

4. Research Methodology

A two-step research approach was used for this study. In the first step, an extensive review was carried out on the existing literature on BPR, with the ensuing analysis focused on two components (BPR's Critical success factors and Organizational Culture). The research identified the constructs of relevant variables of the two components that ensure the success of BPR implementation. In addition, the researcher sought the input of an expert

panel from members of the ASQ community in Qatar. Moreover, existing OC elements were selected to be applied for this study.

The second step is to create a model to measure the success of BPR initiatives from the OC point of view. Therefore, an expert panel was called for from ASQ members and managers of quality departments from different organizations in Qatar. They were asked for their feedback on the importance of the BPR and OC factors. Moreover, they were asked to input from their experience on how each OC factor is correlated with BPR factors.

4.1. Defining BPR Constructs

This section reports the steps followed in conducting a systematic literature review:

- Selection of suitable databases which could provide a sufficient number, types, and varied nature of literature articles
- The time frame of articles
- Filters for inclusion and exclusion of articles (language, type of articles, keywords, selected journals, etc.)
- Themes for classification of articles (year, country, research methods, research design, industry, etc.)
- Significant findings from reviewed articles
- Gaps identified from reviewed articles
- Conclusions and future research directions

To reach the appropriate data related to BPR constructs, Scopus is mainly used by using the following search keywords, "BPR elements," "BPR SCF," and "BPR factors." First, the list of BPR definitions and elements was tabulated in a separate sheet using Microsoft excel using the selected related articles. Then, the list was presented to the expert panel to finalize elements. Finally, with the help of experts, the constructs where the framework facilitating the prioritization of BPR constructs was developed using a fuzzy-treated multi-criteria decision making (MCDM) approach. The detailed research methodology is presented in Figure 1.

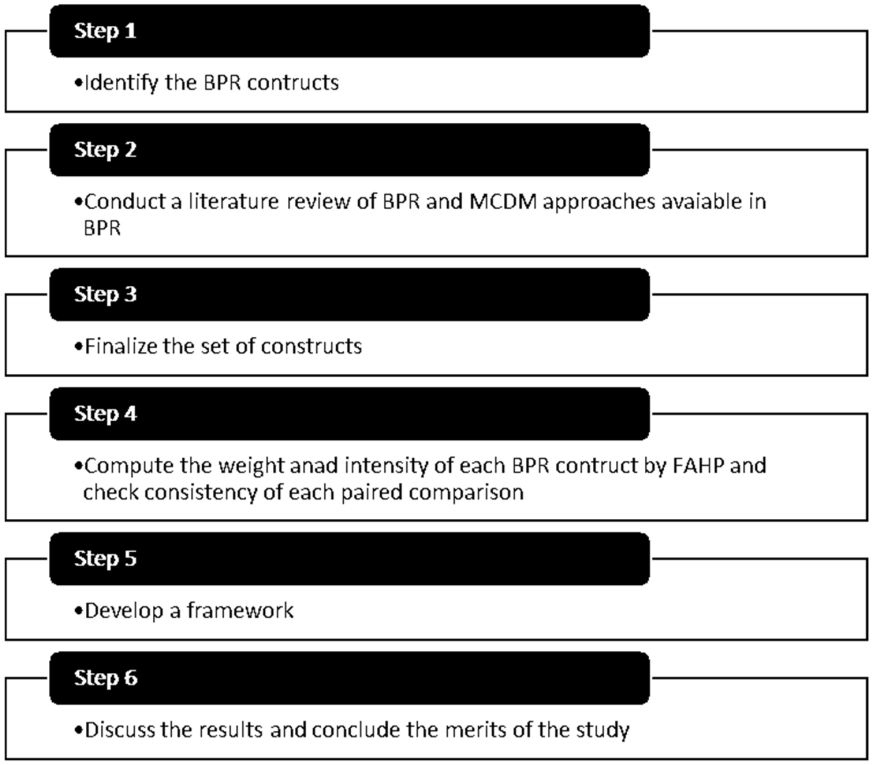

Figure 1. Research methodology for identifying and prioritizing BPR constructs.

4.2. Prioritize BPR Constructs

Analytical hierarchical process (AHP) is a preferred tool that researchers choose to solve complicated organizational problems in research, especially those with many aspects/dimensions [40]. It is a tool used to break the complex problem and structure it into a hierarchy. This helps the researcher to prioritize the solutions effectively [41]. AHP is a multi-criteria decision-making approach that sets a weighting process, with many criteria represented based on their relative importance to each other [42]. The FAHP approach has been adopted and is justified because the BPR critical success factors are subjective and AHP emerges as the prominent choice for computation of weights in the case of subjective factors. Various researchers [43,44] have also adopted this approach for qualitative computing weights.

Although many techniques are available in the MCDM domain, researchers in different decision-making areas have widely utilized the fuzzy analytical hierarchy process (FAHP) to identify criteria' intensity and weights. The major benefit of using FAHP is its capability to tackle vagueness. This approach is carried out by using pairwise comparison. However, the judgments made by decision-makers are further analyzed for consistency to ensure that these judgments are consistent. For a better understanding of the fundamentals of FAHP, the readers can refer to [45,46]. The detailed procedure for executing FAHP is presented in Figure 2. The basic steps involved in FAHP are shown below:

[1] Develop a decision panel.
[2] Define the fuzzy scale for making pairwise comparisons and follow systematic procedure; see Figure 1.
[3] Prepare the fuzzy pairwise comparison matrix (FPCM).
[4] Convert the FPCM into Crisp Comparison Matrix (CCM).
[5] Conduct the consistency check Table 1 for random index).
[6] Determine the weight of each factor included within the matrix.
[7] Prioritize each factor according to the global weight.

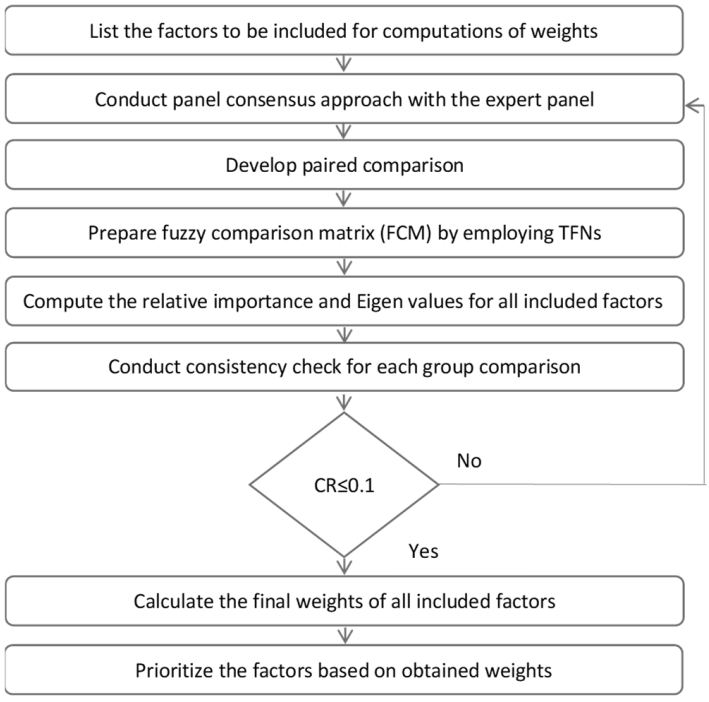

Figure 2. Steps to execute FAHP to prioritize the BPR elements.

Table 1. Scale of Relative Importance.

Scale Description	Defined Fuzzy Number	Membership Function
Equal Importance/Preference	$N1^{\sim}$	(1,1,3)
Weak Importance/Preference	$N3^{\sim}$	(1,3,5)
Strong Importance/Preference	$N5^{\sim}$	(3,5,7)
Very Strong Importance/Preference	$N7^{\sim}$	(5,7,9)
Extremely Strong Importance/Preference	$N9^{\sim}$	(7,9,11)

Table 2 is used for the calculation of the consistency ratio. In order to obtain the matrix to be consistent, the value of the consistency index should be less than or equal to 0.1.

Table 2. Random consistency Index.

Size (n)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
RI	0	0	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49
Size (n)	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
RI	1.51	1.48	1.56	1.57	1.49	1.59	1.60	1.61	1.62	1.63

Thus, the following constructs of BPR implementations are resulted to be used for this study: (i) organizational strategy; (ii) transfer of experience; (iii) leadership; (iv) communication with stakeholders; (v) IT; (vi) end-user satisfaction; (vii) conclusive decision-making; (viii) business case; (ix) project management; and (x) organizational culture change. Moreover, OCP elements were selected to be studied in this study with the addition of one element: the higher educational level of staff.

4.3. Creating the Model

Figure 3 shows the proposed approach for modeling the relationship of success of BPR, taking into consideration the OC elements.

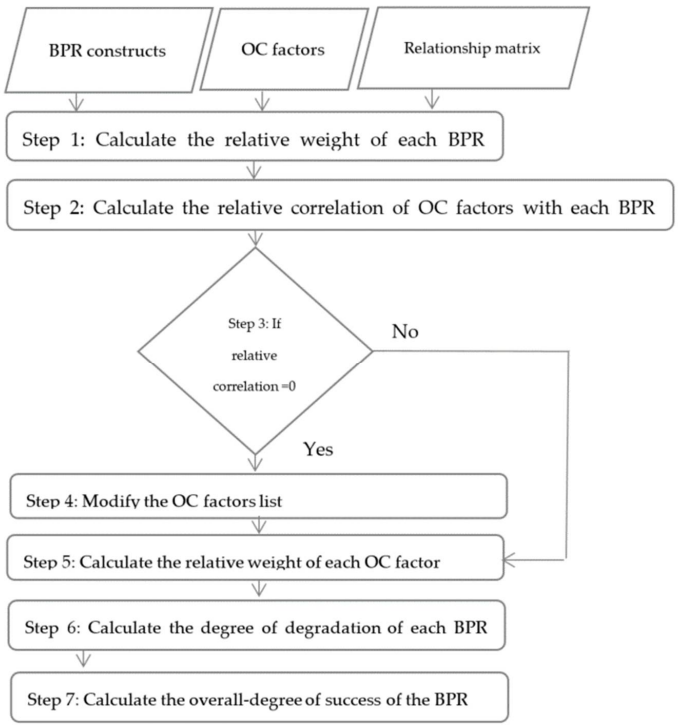

Figure 3. The proposed weighting process.

The following is a detailed description of the weighting process.

Step 1: Calculate the *relative weight* of each BPR construct (C-BPR)

$$RW_i = \frac{w_i}{\sum_{i=1}^{n} w_i} \tag{1}$$

where n is the number of BPR and w_i is the individual weight. In step 1, the researcher calculated the relative weight of each BPR constructs based on its importance. In the beginning, the importance of the calculation was input data during this stage. Then, and because the researcher noticed a difference in the weight from the importance resulting from the first objective's stage, an averaged weight was computed and applied.

Step 2: Calculate the *relative correlation* of the OC Factors.

$$\mathrm{RC_j} = \frac{\mathrm{c_j}}{\sum_{j=1}^{m} \mathrm{c_j}} \tag{2}$$

where m is the number of OC Factors and $\mathrm{c_j}$ is the individual correlation.

The relative correlation of each OC factor is calculated using Equation (2) and as seen in Table 3.

Table 3. Calculating individual and relative correlation.

BPR-C	Correlation	OC·F			
		O_1	**O_2**	**- - -**	**O_m**
BPR_1	Individual correlation	c_1	c_2	- - -	c_m
	Relative Correlation	RC_1	RC_2	- - -	RC_m
- - -	Individual correlation	- - -	- - -	- - -	- - -
	Relative Correlation	- - -	- - -	- - -	- - -
BPR_n	Individual correlation	c_1	c_2	- - -	c_m
	Relative Correlation	RC_1	RC_2	- - -	RC_m

Step 3: If $\mathrm{RCj} \to 0;\ \forall\ j,$ then go to **Step 4**; otherwise, proceed to **Step 5**.

Step 4: Modify the OCF list

Step 5: Calculate the *relative weight* of the OC Factors.

$$\mathrm{RWO_i} = \frac{\mathrm{wo_i}}{\sum_{i=1}^{n} \mathrm{wo_i}} \tag{3}$$

where m is the number of OC factors and $\mathrm{wo_i}$ is the individual weight of the OC factors. Calculate the *actual relative weight* of the BPR-C as follows:

$$ARW_i = \frac{RW_i}{\left(\sum_{j=1}^{m} \mathrm{RC1} \times \mathrm{RWO_i}\right)} \tag{4}$$

Step 6: Calculate the degree of degradation of the BPR-C as follows:

$$D_i = RW_i - ARW_i \tag{5}$$

Step 7: Calculate the overall degree of success of the BPR as follows:

$$DOS - Overall = \sum_{i=1}^{n} D_i \tag{6}$$

5. An Illustrative Case Study

5.1. BPR Constructs Findings

The presented work identified 19 BPR and through a panel of experts. This work resulted in a prioritized list of BPR constructs. First, the organizational strategy is the most critical element in implementing BPR, transferring managerial and working experience and knowledge, then leadership. Furthermore, the fourth and fifth elements are communication with stakeholders and IT.

In addition, the ranking of BPR constructs in this study can aid practitioners in making decisions when implementing BPR. Moreover, it can help them concentrate on high-intensity elements to develop counter-strategies to overcome barriers when implementing BPR, especially during the initial stages. This opens up the possibility of more new research in the BPR area and assists in building upon the created set of BPR elements. Additionally, different MCDM techniques can be employed to enhance the applicability of the results.

The expert panel approach was employed to collect data. A panel of experts approached through the American Society for Quality (ASQ)-Qatar Chapter and a group of Quality Directors in Qatar were surveyed to explore the correlation among them all. The expert panel consisted of 22 experts from all sectors of the Qatar workforce with various years of experience. They were approached through pre-arranged meetings. During each meeting, all BPR constructs and OC factors were explained. Moreover, the details of the input data were discussed with them before seeking their input.

Following the interviews, the responses of the panel experts were collected and the reliability of these responses was measured using the Chronobach Alpha test.

The Cronbach's alpha test, also known as the reliability coefficient, measures the internal consistency of a set of responses. Table 4 displays the general rule for interpreting the Chronebach alpha test.

Table 4. Chronbach Alpha rule of thumb.

Cronbach's Alpha	Consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questinable
$0.6 > \alpha \geq 0.6$	Pooe
$0.5 > \alpha$	Unacceptable

where α is the test parameter. The test was conducted using IBM-SPSS® software. Table 5 reports the statistics of the test.

Table 5. Cronbach's test statistics.

Description	n	%
Valid	22	100.0
Excluded	0	0
Total	22	100.0

where n is the number of participants. Table 6 reports the reliability statistics of the Cronbach's Alpha test. The result exhibits a "Good" level of consistency ($\alpha = 0.826$).

Table 6. Reliability statistics.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items
0.826	0.828

Table 7 details the 19 elements of the BPR and their estimated order of importance, as determined by the proposed weighting method.

Table 7. BPR studied elements and their resulted ranking.

No	BPR Construct Title	Criteria Weight	Rank
1	Organization Strategy	0.056	1
2	Leadership	0.058	3
3	Customer focus	0.037	16
4	Communication with stakeholders	0.056	4
5	Reeducating and retraining people who will ultimately work the new process.	0.030	17
6	Conclusive decision-making	0.052	7
7	Transfer of managerial and working experience and knowledge in the organization	0.060	2
8	Internal Communication	0.046	13
9	Team	0.044	14
10	Project Management	0.048	9
11	Continuous improvement of all processes	0.031	18
12	End-User Satisfaction	0.054	6
13	Ability to Change the Organizational Culture	0.047	10
14	Performance	0.040	15
15	Customer Involvement	0.030	19
16	Business Case	0.049	8
17	IT	0.054	5
18	The ability to change the reporting structure of the organization	0.047	11
19	Automation	0.047	12

5.2. The Model Findings

Following the second and third objectives defined in this research, the model presented herein measures the success of BPR by taking into account the OC factors.

By reading the average relative weight of each BPR construct calculated using the above equations in the model, it is found that the highest important construct among all 10 is the organizational strategy. Leadership, the transfer of experience and end-user satisfaction are second, third, and fourth, respectively (see Figure 4). On the other hand, among OC factors, respect for people came first as the most important factor, as indicated in Figure 5. Finally, innovation and supportiveness came second and third, respectively.

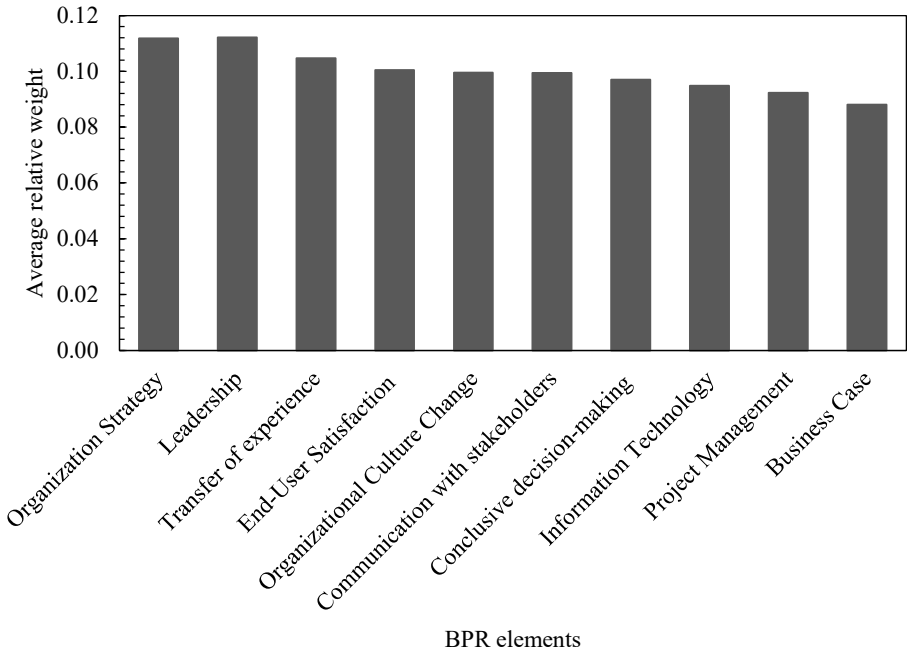

Figure 4. Average relative weights of BPR constructs.

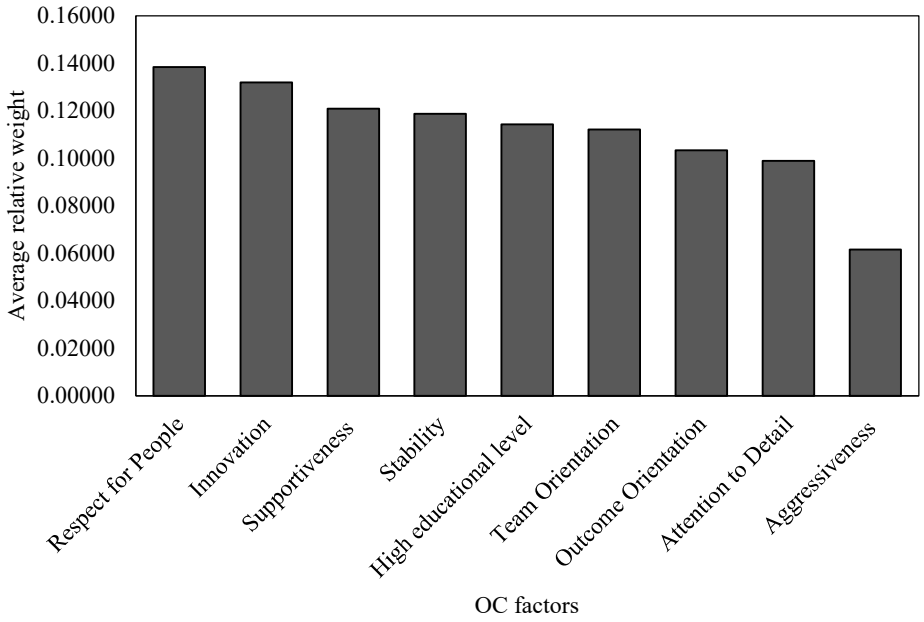

Figure 5. Average relative weights of the OC factors.

The importance of the model is based on the fact that it helped identify the relationship between each BPR construct and all OC factors individually. As a result of this work, the first BPR construct, namely "organizational strategy," is highly correlated with innovation, respect for people, and outcome orientation. For saving the reader's time, only one construct is selected as an illustration in Figure 6. Figure 6 indicates the order in which OC factors are correlated to organizational strategy, which means that this is the order of factors that organizational strategy depends on for its success. The following Tables 8 and 9 show the rest of the BPR constructs correlated to OC factors. The tables list the order of importance of each OC element for each BPR element in the study based on the calculated relative correlation. The highest relative correlation of an OC factor to a specific BPR

construct shows it is the highest important OC factor to that specific BPR construct. In those tables, rank 1 shows the highest important factor in each BPR construct.

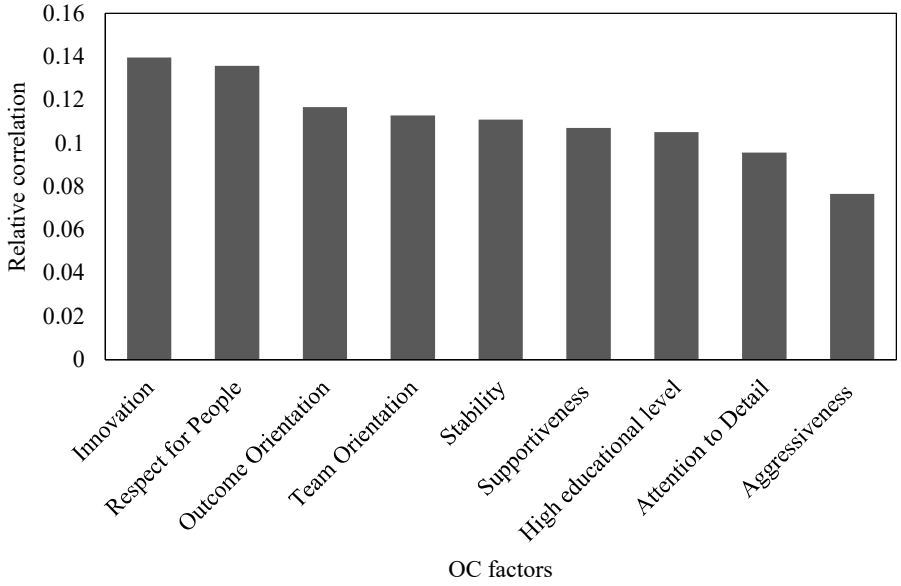

Figure 6. Relative correlation of organizational strategy with OC factors.

Table 8. Relative correlation of BPR constructs with OC factors-group 1.

	Organizational Strategy	**Transfer of Knowledge**	**Leadership**	**Communication with Stakeholders**	**Information Technology**
Rank 1	Innovation	Team Orientation	Innovation	Respect for People	Innovation
Rank 2	Respect for people	Supportiveness	Respect for People	Attention to Detail	Attention to Detail
Rank 3	Outcome Orientation	Respect for People	Supportiveness	Outcome Orientation	Supportiveness
Rank 4	Team Orientation	Attention to Detail	Team Orientation	Innovation	Outcome Orientation
Rank 5	Stability	Innovation	Outcome Orientation	Supportiveness	High Educational Level
Rank 6	Supportiveness	High Educational Level	Stability	Stability	Stability
Rank 7	High Educational Level	Stability	Attention to Detail	Team Orientation	Team Orientation
Rank 8	Attention to Detail	Outcome Orientation	High Educational Level	High Educational level	Respect for People
Rank 9	Aggressiveness	Aggressiveness	Aggressiveness	Aggressiveness	Aggressiveness

Table 9. Relative correlation of BPR constructs with OC factors-group 2.

	End-user Satisfaction	**Conclusive Decision-Making**	**Business Case**	**Project Management**	**Organizational Culture**
Rank 1	Innovation	Outcome Orientation	Outcome Orientation	Team Orientation	Respect for People
Rank 2	Respect for People	Team Orientation	Innovation	Outcome Orientation	Innovation
Rank 3	Outcome Orientation	Innovation	Attention to Detail	Attention to Detail	Supportiveness
Rank 4	Supportiveness	Attention to Detail	Team Orientation	Innovation	Outcome Orientation
Rank 5	Attention to Detail	Stability	High Educational Level	Supportiveness	Team Orientation
Rank 6	Stability	Supportiveness	Stability	High Educational Level	Stability
Rank 7	Team Orientation	Respect for People	Supportiveness	Stability	High Educational Level
Rank 8	High Educational Level	Aggressiveness	Respect for People	Respect for People	Attention to Detail
Rank 9	Aggressiveness	High Educational Level	Aggressiveness	Aggressiveness	Aggressiveness

6. Results and Discussion

To answer the question, "What are the main elements that construct/define BPR initiatives in Qatar's Public and Private Service sector?" the study's first objective was to identify and prioritize the elements of BPR initiatives. Therefore, a panel of experts was formed to study 19 factors and they identified the top important 10 constructs. They are listed subsequently in ascending order of the most important constructs to the success of BPR implementation:

1. Organizational strategy;
2. Transfer of experience;
3. Leadership;
4. Communication with stakeholders;
5. Information technology;
6. End-user satisfaction;
7. Conclusive decision-making;
8. Business case;
9. Project management; and
10. OC change.

Moreover, to answer the second research question, "Does the OC correlate with BPR constructs?", two objectives guided the work of this study:

1. To assess the relative correlation between the elements of BPR and OC; and
2. To develop an analytical approach to assess the success of BPR initiatives with specific settings of the elements of an OC.

To accomplish this, the results of the first research question were used to represent the BPR constructs and OCP factors. An analytical model was created to assess the relative correlation between model elements and evaluated through a panel of experts in Qatar. This resulted in a model that can aid practitioners in finding the correlation (strong-medium-weak) between elements of BPR on one side and OC factors on the other. The strong correlation sign is given to the three OC factors with the highest correlation with the BPR. The medium correlation is given to the following three elements and the weak correlation is given to the last three OC factors among the nine. In the applied case, it was found that respect for people, outcome orientation, and innovation are highly correlated OC factors with organizational strategy. This indicates that those three elements are very important in strengthening the first construct of BPR.

To summarize the results collected from this work, the results of this model are exhibited in Table 10.

When reviewing Figure 5, it is seen that the leadership construct is highly correlated to three elements: respect for people, innovation, and supportiveness. Transfer of knowledge is correlated highly to respect for people, supportiveness, and team orientation. End-user satisfaction is correlated highly to respect for people, innovation and outcome orientation. The OC construct is correlated highly with respect for people, innovation, and supportiveness. Communication with stakeholders is highly correlated with respect for people, attention to detail, and outcome orientation. The conclusive decision-making construct is highly correlated with outcome orientation, team orientation, and innovation. The IT construct is highly correlated with innovation, attention to detail, and supportiveness. The project management construct is highly correlated with team orientation, attention to detail, and outcome orientation. Finally, the business case construct correlates with outcome orientation, innovation and attention to detail.

Table 10. The BPR and OC relationship matrix.

Table Key ◎ **Strong Relation** ○ **Medium Relation** ☐ **Weakrelation** **BPR Factors** / **OC Factors**	**Relative Importance**	**Respect**	**Innovation**	**Supportiveness**	**Stability**	**High Educational Level**	**Team Orientation**	**Outcome Orien-tation**	**Attention to Details**	**Aggressiveness**
Organization Strategy	11.17	◎	◎	○	○	☐	○	◎	☐	☐
Leadership	11.21	◎	◎	◎	○	☐	○	○	☐	☐
Transfer Experience	10.47	◎	○	◎	☐	○	◎	☐	○	☐
End-Use Satisfaction	10.04	◎	◎	○	○	☐	☐	◎	○	☐
Organizational Culture Change	9.98	◎	◎	◎	○	☐	○	○	☐	☐
Communication with Stakeholders	9.94	◎	○	○	○	☐	☐	◎	◎	☐
Conclusive Decision Making	9.7	☐	◎	○	○	☐	◎	◎	○	☐
Information Technology	9.48	☐	◎	◎	○	○	☐	○	◎	☐
Project Management	9.23	☐	○	○	☐	○	◎	◎	◎	☐
Business Case	8.8	☐	◎	☐	○	○	○	◎	◎	☐

Moreover, the model helps identify the relative importance of each element in the group. For example, in the applied case study, it was found that the constructs of BPR are ordered according to the most important:

1. Organizational strategy;
2. Leadership;
3. Transfer of experience;
4. End-user satisfaction;
5. OC Change;
6. Communication with stakeholders;
7. Conclusive decision-making;
8. IT;
9. Project management; and
10. Business case.

On the other hand, it was found that the elements of OC are ordered according to the most important:

1. Respect for people;
2. Innovation;
3. Supportiveness;
4. Stability;
5. High educational level;
6. Team orientation;
7. Outcome orientation;
8. Attention to detail; and
9. Aggressiveness.

Other researchers presented relationship study results between BPR and OC individual factors without a depth in effect or correlation of OC factors. [47–49] identified seven factors

that are important to the success of BPR. Those factors are teamwork and quality culture, quality management system, effective change management, less bureaucracy, IT, project management and financial resources. [50] studied BPR factors in Airlines and came up with recommendations to middle managers. Some of them are knowing more about and responding to the company's internal and external communication and increasing the employee's involvement and empowerment in the company. Huang, et al. [51] studied the direct relationship between BPR and employee performance. The results indicated a strong positive association to cost reduction and lead time to shortened work processes.

7. Conclusions and Remark

This paper introduced a seven-step fuzzy analytical hierarchy process (FAHP) approach for integrating the BPR factors with OC to ensure the effectiveness of the BPR's initiatives. The proposed model was investigated through a real case study. A panel expert from the American Society for Quality (ASQ) members' network-Qatar chapter was used to validate the selected factors. The results showed that the highly important BPR factors are (1) organizational strategy, (2) leadership, and (3) transfer knowledge. The results also showed that the most important OC cultures are (1) respect for people, (2) innovation, and (3) supportiveness. The correlation analysis study has shown that these factors are highly correlated with the top three BPR factors. Another notable finding is that the team orientation, outcome orientation and attention to detail factors have a medium correlation with the BPR factors. Moreover, the aggressiveness showed a weak correlation with all the BPR factors. Finally, the authors believe that these findings would be helpful for decision-makers with for successful integration of the BPR and OC factors to ensure effective implementation of the BPR initiatives.

The authors recommend extending the proposed approach to include several services and production organizations for future research works. In addition, other analytical approaches such as neural networks and fuzzy technical for order of preference by similarity (TOPSIS) are suggested for future research.

There were some limitations found in the study. First, most BPR studied constructs were taken from the same pool. There is a need to create new constructs defined by the industry to avoid generalizing them. There must be more studies of BPR models and elements in different parts of the world. The developing countries should be studied too. Finally, the body of knowledge needs more study of correlations of different elements affecting BPR projects. Most current studies analyze BPR again productivity only.

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