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Identifying the Main and Secondary Components Affecting Organizational Agility in the Petroleum University of Technology

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ABSTRACT

This applied research was carried out to identify the primary and secondary components affecting organizational agility in the University of Petroleum Industry, PUT. In the qualitative section, by reviewing the researches and using a designed questionnaire, 13 hypotheses affecting the organizational agility of the PUT were evaluated. The statistical population includes 229 experts working in Ahvaz, Abadan, Tehran, and Mahmoudabad colleges. According to the results, out of 42 identified sub-components, 39 components and 13 main hypotheses were confirmed. The results show that the principal practical organizational agility components followed are organizational agility, human resource value creation, organizational leadership, strategic agility of managers, ICT management, training and empowerment of faculty and staff, establishing knowledge management, strengthening university infrastructure, and university culture. It should be noted that SMART PLS software and the partial squares technique were used to test the hypotheses.

1. Introduction

The word agility means fast, agile, active, and the ability to move quickly and easily or think quickly and intelligently. The root of agility is agile production, and it means the organization's ability to sense, perceive, and anticipate changes in the business environment (Sharifi, 2001). Goldman et al. defined organizational agility as giving value to the customer, being prepared to face change, paying attention to skills, and creating employee engagement (Goldman, 1995). Organizational agility is a strategy described in environments characterized by uncertainty and rapidly changing (Aghaei, 2014). Organizational agility is an organization's ability to operate profitably in a constantly competitive environment by constant changes in customer needs

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(Goldman, 1995). An agile organization is an organization that can respond to unforeseen and unexpected changes with appropriate methods and at the right time. In addition, it has the necessary skills to take advantage of change and gain the benefits of change as opportunities. Agile organizations emphasize continuous work and movement and are more integrated than their predecessors (Aghaei, 2014).

Richard Sharp expressed the agility of the university as a living human system to flourish and learn from constant waves of change so that change emerged as a natural and inevitable part of the organization. On the other hand, the change should not be considered separate and threatening (Sharpe, 2012). The concept of agility was first introduced by researchers at the Yakuka Foundation in 1991, while past approaches and solutions have lost their ability to meet the challenges belonging to the organizational turbulences and external environment. Therefore, organizational agility is considered one of the recommended ways to respond to organizational change. In fact, agility is a new paradigm for engineering competitive organizations and firms. Although agility and flexibility are somewhat close, they have significant differences.

Agility refers to speed and dexterity as a measure of reaction time to change, while flexibility measures reactivity to change. On the other hand, agility is essentially related to the organization's overall ability (Goldman, 1995), while flexibility refers to the operational capabilities, such as those found in manufacturing processes (Goldman, 1995). In other words, it can be said that agility arises from the synergy of the flexibility of each component of the company chain. On the other hand, the importance of discussing organizational knowledge is considered one of the organizations' development strategies (Erhan, 2015). It should be noted that one of the essential tools of the organization to achieve agility is the workforce. In fact, human resources, as the most central part of any organization, can be considered an important tool to promote agility, in which organizations need empowered human resources.

Employee empowerment is a set of systems, methods, and actions that are used by developing the capabilities and competencies of individuals to improve the productivity, growth, and prosperity of the organization and workforce, according to the organization's goals. Today's world is constantly changing and age of instability, profoundly affecting the organization. Therefore, organizations must adapt to the changes that threaten them to survive, which can be worked directly and indirectly. There is an urgent need for development, improving flexibility, and organizational accountability in competitive markets.

Meanwhile, many organizations face increasingly sustained and unreliable competition, exacerbated by technological innovations, changing market environments, and changing customer needs. This critical situation has led to significant reforms in the organization's strategic vision. Although agility allows the organization to react much faster than in the past, the strength of agile competitors raised from predicting the response to customer needs and leadership in creating new markets through continuous innovation (Memarzadeh, 2014). Agility is a comprehensive response to the new competitive environment in which there is no place for employees who say yes and those who do well in continuous and consistent work. Instead, organizations are places for creative and innovative people who respond appropriately to change. This makes it more critical to examine staff agility and all types of lacks affecting agility to cope with the changing environment (Sherehiy, 2007).

University of Petroleum Industry (PUT) has a diverse geographical distribution that is active in Tehran, Mazandaran, and Khuzestan in the cities of Tehran, Mahmoudabad, Ahvaz, and Abadan; therefore, it will be affected by many environmental changes. Breaking the monopoly of this university in attracting students in the field of petroleum engineering and creating the same engineering fields in other universities of the country are among the other issues that necessitate a timely response to environmental changes for this university. The lack of quick and timely response of the PUT to environmental changes following the emergence of many competitors is one of the severe problems of this university.

Numerous studies have been done on organizational agility, but this study aims to identify the primary and secondary components affecting agility in this particular organization. Given the importance of organizational agility in today's environment, it is necessary to identify the factors affecting it to achieve its goals (Abolghasemi M, 2017). The PUT is 80 years old and, despite its brilliant history, cannot attract the favorable opinion of the Ministry of Petroleum of Iran as an employer. This indicates a change in circumstances, one of the most important of which seems to be the lack of agility in the last two decades.

In the last two decades, various universities have recruited undergraduate and graduate students in

petroleum engineering. As a leading university in the oil, gas, and petrochemical industry, it was expected that the PUT would still retain its particular position, which appears to be far from achievable. With the initial study of the organization and review of the researches, it appears that lack of agility is one of the critical problems of the understudy organization. Therefore, in this study, it was decided to identify the primary and secondary factors affecting organizational agility, and based on that, suggestions for agility should be given. On the one hand, identifying the dimensions and the factors affecting the success of organizations for agility and, on the other hand, examining the relationship between these factors is a vital necessity for study and research in the organization under study. For example, the structural dimension as one of the critical parameters of the university can play an essential role in responding to the needs and complexities of the external environment. For instance, the structure should allow all learners trained in the university to interact with complex environmental changes (Ahmadi Asl, 2018).

Today, organizations need agility due to short-term market opportunities, unpredictable continuous changes in market level, and taking advantage of opportunities (Jafarnejad A., 2007). It is shown that human capital is an essential factor in the functioning of production and in explaining the differences in agility and growth of organizations between different countries. Hong and Huang believe that the origin of agility is agile production and agile production is a concept that has become common in recent years (Hun, 2001). This concept has been embraced as a successful strategy by manufacturers who prepare themselves to increase performance significantly. In such an environment, each organization must simultaneously produce short-lived products, redesign products, change production methods, and respond effectively to changes. An agile organization is an organization that has such a view on issues. Different researchers have presented groups of different indicators and requirements regarding the needs of organizational agility. Four main strategic dimensions were developed emphasizing the achievement of agile competitiveness capabilities, named enriching the customer, working together to increase competitiveness, organizing for fundamental change, and leveraging the impact of people and information (Sambamurthy, 2003), (Yusuf, 1999).

Agility is achieved only by integrating the hierarchy of customer needs in a framework of the internal and external environment of the organization, achieved by a general view of the advanced production technologies of the organization with internal capabilities and through the application of information systems technology. The agile production enablers were described as integration, competence, team building, technology, quality, transformation, participation, market, education, and well-being. By reviewing the literature on agility, Jafarnejad and Shehai introduced twenty criteria of agility, which include organizational structure, delegation, production drive, employee status, employee participation, management nature, customer response acceptance, product life cycle, product service period, improved design, production method, production planning, cost and accounting systems, automation, information technology integration, change of work and technical processes, time management, quality, productivity, and outsourcing (Jafarnejad, 2007).

Agility requires an essential ability for an organization to sense, perceive, consider, analyze, and anticipate changes in the business environment. Thus, the agile producer is an organization that has a broad vision of the new world order of business. This type of organization uses its capabilities to deal with turbulence and capture the beneficial aspects of change flows (Davis, 2009). It was stated that agility is the ability of an enterprise to survive and thrive in a competitive environment where changes are continuous and unpredictable. On the other hand, it can respond quickly to the constant market changes due to customer valuation of products and services. Agility as a productive philosophy (the next generation of production systems) welcomes the organizations that compete in all sectors of the economy. Agile organizations think beyond adapting to change, take advantage of potential opportunities in a turbulent environment, and gain a foothold through their innovations and competencies. Agile organizations think differently about satisfying customer needs.

These organizations sell their products and sell solutions to meet customers' real needs (Simon, 2011). These organizations believe that their products are not complete and try to enrich their product to enrich the values received by customers or create added value for them, making the position of agile organizations inaccessible to competitors. In addition, agile organizations focus on designing or developing products that specifically address customers' unique needs.

The need for effective and fast design means that the traditional approach to having new products has failed (Gardas, 2019). Brian Muskle defined agility as the ability to thrive in a constantly changing and unpredictable environment (Maskell, 2001). In this

regard, organizations should not be afraid of and avoid changes in their work environment; instead, they should see change as an opportunity to gain a competitive advantage in a market environment. Agility can be defined as the close alignment of the organization with the needs of variability to gain a competitive advantage. In such an organization, the employees' goals align with the organization's goals, and these two seek to respond appropriately to the changing needs of customers.

Further, since change is one of the most outstanding characteristics of organizations and institutions in today's competitive field, technological change or any other change requires managerial and organizational variations. Such developments have led organizations to seek capabilities to produce various products, according to customer needs, in the shortest time and at the lowest cost, improve quality, create innovation in products and services, and generally more flexibility to environmental needs. Goldman et al. considered agility to apply new and effective communication technologies (Goldman, 1995). According to them, agility involves four interrelated principles. Sharifi and Zhang presented a conceptual model that includes organizational agility tools, reinforces, capabilities, and agility drivers (Sharifi, 2001). According to them, organizational agility tools include organizational structure, people, information technology, innovation, and creativity, while, in the Atoz Consulting Group model, the organization's agility depends on the maturity and flexibility of the organization. In this model, activities related to organizational agility at three levels of strategic management, tactical management, and operational management are examined. In fact, the organizational agility in this model means flexibility and the ability to react to environmental changes, which is possible through constant reinforcement. Permanent reinforcement is also achieved by acquiring awareness, flexibility in the organization, and a control system. Using the related literature and brainstorming sessions, they provided a multivariate set for agility. Sharp is a theoretical model for agile production with three essential model components, model enablers, and model outputs. Sharp et al. considered empowerment to include competency focus, virtual enterprise, rapid prototype building, simultaneous engineering, flexible and multidisciplinary people, continuous improvement, carte blanche, change and risk management, information technology, and employee empowerment (Sharpe, 2012). In 2020, Mahdieh conducted a study entitled "The effect of organizational learning on organizational agility with the mediating role of psychological empowerment" in the Regional Electricity Company of Zanjan Province (Mahdieh, 2020). This study concluded that organizational learning and psychological empowerment have a positive and significant effect on organizational agility and examined the effect of organizational learning on psychological empowerment (Mahdieh, 2020).

On the other hand, Feizi identified eight process steps in the form of three groups of "proportionality", "commitment to risk", and "post-risk" (Feizi, 2020). Ghiasi also identified the principal dimensions and indicators in the culture of intellectual capital in Iranian universities and then analyzed them using interpretive structural modeling (Ghiasi, 2020). It was concluded that ethics-oriented principals and students familiar with Iranian–Islamic culture are independent variables of this study and the other variables are the type of interface variables that have a lot of dependence and guidance. Indeed, to change the culture-oriented intellectual capital of the university, it is necessary to change these variables (Ghiasi, 2020). In a study in the field of higher education done in the form of in-depth interviews and data analysis, Ahmadi Asl concluded that the realization of dynamic learning in the university requires levers as reforming structures and removing existing structural barriers by creating flexible and dynamic structures (Ahmadi Asl et al., 2019).

Moreover, informal structures and creating a suitable environment for the activity of invisible structures of the university are the other important ones (Ahmadi Asl et al., 2019). In a study based on Gelman and Nagel model of first using the opinion of experts and Delphi technique, Farjad identified 46 variables as the agility of organizational structure of universities and showed that the most critical indicators included stability in university management, clear vision, organizational learning and scientific mission, monitoring and evaluation system of research performance, the culture of self-evaluation, self-control and self-improvement, attention to teamwork in universities, managers' attention to research results, establishing researcher's support fund, the re-engineering of organizational structures and current processes, and the existence of research units for commercialization in universities. The initial conceptual model classified the parameters under five main categories (Farjad Sh, 2016). Haditabar, in their study, approved flexibility, knowledge capability, and accountability culture as the factors of agility in knowledge-based companies (Haditabar, 2017).

Sanatigar concluded that leadership agility, service agility, employee agility, organizational and IT

processes, and communication are essential and influential factors on organizational agility (Sanatigar, 2017). Sarlak showed that the most critical factors in organizational agility are related to giving importance to people, information technology, readiness for change, organizational coordination, environmental uncertainty control, and employee empowerment (Sarlak, 2016). Further, by examining the relationship between teamwork and organizational agility, it was concluded that these two variables have a significant relationship. In addition, aimed at identifying and prioritizing the factors of organizational agility empowerment in universities, it was concluded that seven factors of culture, the formation of a knowledge-based organization, agile workforce, continuous improvement, partnership and cooperation, information technology, and structure of the organization are considered the vital structural enablers of the organizational agility in universities. Memarzadeh concluded that six factors of employee flexibility, employee responsiveness, organizational change culture, employee speed in response to environmental changes, integration and low complexity in organizational structure, and cooperation of employees and their managerial functions have a positive and significant effect on organizational agility of employees (Memarzadeh, 2014).

Aghaei concluded that organizational agility includes organizational factors, human factors, strategic factors, and technological factors (Aghaei, 2014). Zare concluded that the dimensions of servant leadership, including service and love, trustworthiness, humility, and modesty, affect organizational agility, among which trustworthiness has the highest priority (Zare, 2013). In another work, Nikbakht reported that the components of empowerment in the form of three factors of organizational conditions, management strategies, and self-efficacy resources in promoting agility indicators, including four components of customer response, readiness to face change, the importance of skills and staff knowledge, and ultimately, the degree to which activities are virtual are practical (Nikbakht, 2013). Abbaspour concluded that agility in the university consists of four components of stimuli, capabilities, empowerment, and consequences.

These findings indicate some drivers of change and agility in universities, including changes and transformations in technology, constant changes in student expectations, and changes and complexities in the environment, economics, and knowledge. Universities need remarkable capabilities, including structure, agile workforce, culture, and information technology, to achieve these capabilities. It should be noted that these capabilities and empowerment ultimately lead to the production of qualified graduates and the production of knowledge needed by different sections of society (Abbaspour, 2012). In a study entitled "Model for organizational agility in the Iranian electronics industry", Ulfat showed that the most effective structures in the agility of total quality management are technology management and lean manufacturing (Ulfat et al., 2009). In another work, Daniel concluded that employee competency management has a significant impact on organizational agility; based on this, these managers are advised to adapt to changes that occur in the future effectively. For agility, they must increase the competency required in the organization through qualified employees (Daniel, 2020). Those who want to compete and create added value have become necessary in today's business environment (Joiner, 2019). Ridwadono, an Indonesian researcher reviewing research on IT and organizational agility, stated that the four dimensions of information technology in organizational agility are alignment, IT governance, operating system governance, and IT architecture, playing an essential role in organizational agility (Ridwadono, 2019).

Romiana Ilieva, as a result of a study conducted in Bulgaria, found a model for organizational agility in which the main components of agility activators, agility stimuli, and agility barriers affect organizational agility and characteristics. It also determines the capabilities of organizational agility. The sub-components of agility activators were identified, such as system motivation, skills and training, leadership and management, and ultimately team coordination. The sub-components of agility drivers are competition, market change, technological advancement, and customer change. It was considered that increasing competitiveness, skills, mastery, and aristocracy to change, enriching customers, and increasing information are characteristics of an agile organization; finally, the capabilities of an agile organization are flexibility, time adaptation, competence, and responsibility (Ilieva, 2018). In a study in the Czech Republic, Shaha concluded that organizational agility highlights the effectiveness of practical resources in increasing organizational performance and competitiveness (Shaha, 2017). J. Prakash reported that the agility model should include organizational skills, motivators, and providers of these abilities. These factors can help the organization meet the customer's diverse needs with effective cost and good quality (Jai, 2017). Anas Al-Hadid researched the

Jordanian Technology Organization and demonstrated a positive correlation between organizational agility and organizational performance (Anasy, 2016).

A study of 122 large Spanish companies illustrated that the effectiveness of the collection not only supports knowledge management processes and the application of knowledge has a direct impact on the organization's performance but also is related to organizational agility (Joseph, 2020).

2. Methodology

The research goal is to find the truth, and what researchers are doing is trying to get closer to the truth. However, this does not mean that the results obtained from research activities are 100% true because the ways and methods of cognition and study are unlimited and human consciousness to discover the truth is limited. Therefore, achieving or approaching the research objectives will be possible when the research methodology is done correctly (Moradi, 2011). This research is based on applied and mixed-type data collection methods. In the qualitative section, valid scientific sources were used by collecting and reviewing domestic and foreign studies. As a result of qualitative studies, 9 main categories and 42 subcategories were identified in this study. Accordingly, the initial model of drawing Weber was defined based on 13 hypotheses. In the quantitative part, to test the hypotheses, using the Morgan table and Cochran's formula, a statistical sample of 214 people was determined, and then a researcher-made questionnaire of 42 questions was developed (Appendix A). The factor load was greater than 0.5 in all cases, so items play an essential role in explaining each factor. T-statistic was also obtained in all of the cases more than 1.96, so the observed factor loads are statistically significant. Due to the conditions caused by the Covid-19 virus epidemic, questionnaires were sent to the upload site, and its link was sent to about 400 members of the statistical community, and finally, 229 employees at the PUT participated in the research (Appendix B). SMART PLS software and the partial squares technique were used to test the hypotheses. The nine main structures include organizational leadership, academic culture, knowledge management, information technology management, university infrastructure, strategic agility of managers, training, empowerment of members, organizational value creation, and organizational agility. The mean extracted variance (AVE) is higher than 0.5, so all data have convergent validity. Cronbach's alpha of all variables is higher than 0.7, confirming the reliability. The value of combined reliability (CR) is also greater than AVE, and, in all cases, it is greater than the threshold of 0.7; thus, the third condition is met. It should be mentioned that the sample size was calculated using Cochran's formula, and the result of 214 was obtained (Equation 1).

$$n = \frac{PqNZ^2}{d^2(N-1)+PqZ^2} \quad (1)$$

where n represents the sample size; N is the size of the research community; Z is the value of the normal distribution variable of the standard unit at the 95% confidence level (1.96); p stands for the value of the attribute ratio in the community and is considered 0.5 to maximize the variance when it is not available; q represents the probability of occurrence equal to $1 - p$; d is the allowable error value considered 0.05.

One of the methods for calculating reliability is Cronbach's alpha coefficient (Equation 2). If Cronbach's alpha coefficient is calculated for a scale greater than 0.7, the reliability of that optimal scale is evaluated. The reliability of the questionnaires was confirmed by calculating Cronbach's alpha coefficient.

$$\alpha = \frac{k}{k-1}\{1 - \frac{\sum S_i^2}{S_X^2}\} \quad (2)$$

where a is Cronbach's alpha coefficient, K represents the number of questionnaire questions, S_i^2 denotes variance for question i, and S_x^2 indicates the total variance of the test. In this study, in addition to calculating the composite reliability, Cronbach's alpha was also calculated, and Cronbach's alpha of all nine structures is higher than 0.7. Therefore, the reliability of all structures is confirmed. Table 1 summarizes all factor loads and statistical T-values. Also, in the following, all of the corresponding hypotheses are given.

Hypothesis 1: Organizational leadership has a positive and significant effect on academic culture in the PUT.

Hypothesis 2: Organizational leadership has a positive and significant effect on knowledge management in the PUT.

Hypothesis 3: Organizational leadership has a positive and significant effect on information technology management in the PUT.

Hypothesis 4: University infrastructure has a positive and significant effect on university culture in the PUT.

Hypothesis 5: University infrastructure has a positive and significant effect on knowledge management in the

PUT.

Hypothesis 6: University infrastructure has a positive and significant effect on information technology management in the PUT.

Hypothesis 7: University culture has a positive and significant effect on the strategic agility of managers in the PUT.

Hypothesis 8: Knowledge management has a positive and significant effect on the strategic agility of managers in the PUT.

Hypothesis 9: IT management has a positive and significant effect on the strategic agility of managers in the PUT.

Hypothesis 10: Strategic agility of managers has a positive and significant effect on the training and empowerment of members in the PUT.

Hypothesis 11: The strategic agility of managers has a positive and significant effect on the value creation of human resources in the PUT.

Hypothesis 12: Training and empowering members positively and significantly affect organizational agility.

Hypothesis 13: Human resource value creation positively and significantly affects organizational agility.

Table 1: Factor loads and statistical T-values

Parameters	Items	Factor loads	Statistical T-value
Organization agility	Identifying the strengths and weaknesses of the organization (Q01)	0.880	45.055
	Flexibility and adaptability to the environment (Q02)	0.920	67.185
	Improving the process of doing things (Q03)	0.822	29.698
	Competence and achieving goals (Q04)	0.823	22.020
	Optimal responsiveness to individuals (Q05)	0.824	32.633
	Increasing people's satisfaction (Q06)	0.800	20.352
	Updating and enriching strategic and operational plans (Q07)	0.803	20.069
	Attention to the geographical dispersion of the university (Q08)	0.773	18.425
Value creation of human resources	Merit and succession (Q09)	0.862	29.141
	Performance-based payment system (Q10)	0.853	30.369
	Support for senior managers (Q11)	0.903	50.075
	Increasing interaction and inter-unit communication (Q12)	0.923	62.362
	Increasing people's participation in macro decision making (Q13)	0.920	54.674
Leadership	Dynamics, style, and attitude of leadership (Q14)	0.867	32.615
	Talent management (Q15)	0.855	30.660
	Leadership skills to resolve existing conflicts (Q16)	0.832	23.572
	Ability to make bold and quick decisions (Q17)	0.844	22.105

Parameters	Items	Factor loads	Statistical T-value
Strategic agility of managers	Performance monitoring and evaluation (Q18)	0.790	10.410
	Having systemic thinking (Q19)	0.819	15.427
	Commitment to the organization's vision (Q20)	0.839	18.489
	Risk and crisis management (Q21)	0.857	28.776
	Having team-building skills (Q22)	0.821	28.776
IT	Upgrading and integrating information systems and upgrading information security (Q24)	0.882	20.042
	Targeted development of information technology in the university (Q25)	0.868	28.100
	Provision of software and hardware facilities (Q26)	0.862	24.636
Training and empowering of members	Updating the course headings (Q27)	0.920	45.428
	Standardization of training programs (Q28)	0.902	38.039
	Strengthen participation in research activities (Q30)	0.876	21.399
Knowledge management	Increasing general university knowledge (Q31)	0.660	5.633
	Increasing university technical knowledge (Q32)	0.636	6.138
	Review and amend administrative, financial, educational, and research regulations (Q33)	0.876	49.934
organizational structure	Attract new staff and faculty members (Q34)	0.875	40.548
	Upgrading and updating the organizational structure (Q36)	0.902	34.784
	Strengthening welfare, student and laboratory facilities (Q37)	0.903	60.105
Culture of university	Commitment to ethics and professional ethics (Q38)	0.903	57.590
	Establishing a learning culture (Q39)	0.898	47.253
	Implementing a culture of trust and commitment (Q41)	0.704	7.314
	Establishing a culture of agility capability development (Q42)	0.672	3.120

3. Research findings

After analyzing all the data with partial quadratic technique and using SMART PLS software, the standard factor load of the effect of organizational leadership on academic culture is represented as 0.203. Moreover, the value of the t-statistic was obtained as 2.289. Therefore, it can be claimed with 95% confidence that organizational leadership has a positive and significant effect on university culture. The common factor for the effect of organizational leadership on knowledge management and the value of t-statistic were 0.343 and 3.869 respectively.

Therefore, with 95% confidence, it can be claimed that organizational leadership has a positive and significant effect on knowledge management. The common factor of the effect of organizational leadership on information technology management was obtained as 0.406 with the value of t-statistic as 5.510. Therefore, it

can be claimed that organizational leadership positively and significantly impacts IT management with 95% confidence.

The common factor of the effect of university infrastructure on university culture is 0.766, which is proved by a statistical value of t of 8.812 with 95% confidence of a positive and significant effect of university infrastructure on university culture. On the other hand, the standard factor load of the effect of academic infrastructure on knowledge management is 0.441 with a t-statistic value of 4.378, so the positive and significant effect of these two parameters on each other is proven. In addition, the common factor of the impact of academic infrastructure on information technology management is 0.343, and the value of t-statistic is 4.456. Therefore, it can be claimed with 95% confidence that the university infrastructure has a positive and significant effect on IT management. Regarding the effect of academic culture on the strategic agility of managers, the value of the common factor is 0.281, which, with a t-statistic value of about 2.518, proves a positive and significant relationship between these two factors. Furthermore, the value of t-statistic was obtained to investigate the effect of knowledge management on strategic agility of managers as 2.064, which proves a positive and significant relationship between them with a standard operating load of 0.272 with 95% confidence.

The common factor of the effect of IT management on the strategic agility of managers is 0.380, which, with a value of t-statistic of 4.457, proves with 95% confidence that IT management positively and significantly affects the strategic agility of managers. The value of t-statistic to investigate the effect of strategic agility of managers on training and empowerment of members is equal to 8.174. On the other hand, the standard load of 0.804 proves the positive and significant effect of these two parameters on each other.

In addition, the standard value of the effect of managers' strategic agility on human resource value creation is 0.595, which with a t-test of 6.607 with 95% confidence, can be claimed that managers' strategic agility has a positive and significant effect on human resource value creation. On the other hand, the effect of training and empowerment of members on the organization's agility is positive and significant because it has a standard operating load of 0.576 and a value of t-statistic equal to 6.204. Finally, the common factor of the effect of human resource value creation on organizational agility is 0.467. With a t-value of 5.256 with 95% confidence, it can be claimed that the value creation of human resources has a positive and significant effect on organizational agility. Table 2 summarizes the test results of the research hypotheses. All the hypotheses are confirmed.

Table 3. Total variance explained using principal component analysis.

Independent variable	Dependent variable	Factor load	t-statistic value	Result
Leadership	University culture	0.203	2.289	Accepted
	Knowledge management	0.343	3.869	Accepted
	IT	0.406	5.510	Accepted
University infrastructure	University culture	0.766	8.812	Accepted
	Knowledge management	0.441	4.378	Accepted
	IT	0.343	4.456	Accepted
University culture	Strategic agility of managers	0.281	2.518	Accepted
Knowledge management	Strategic agility of managers	0.272	2.064	Accepted
IT	Strategic agility of managers	0.380	4.457	Accepted
Strategic agility of managers	Training and empowerment of members	0.804	8.174	Accepted
	Value creation of human resources	0.595	6.607	Accepted
Training and empowerment of members	Organization agility	0.576	6.204	Accepted

Independent variable	Dependent variable	Factor load	t-statistic value	Result
Value creation of human resources	Organization agility	0.467	5.256	Accepted

4. Discussion

This study determined the main and sub-components affecting organizational agility. After studying the internal and external research in authoritative scientific sources, the main structures affecting organizational agility were extracted, and 13 hypotheses were defined. A 42-item researcher-made questionnaire was used to test the hypotheses, which after analyzing all the gathered data with the method of partial squares, all 13 hypotheses were confirmed. Based on the results, the subcategories of organizational agility are identifying the strengths and weaknesses of the organization, flexibility, and adaptability to the environment, improving the process of doing things, competence and achieving goals, the optimal response to people, increasing people's satisfaction, updating and enriching strategic and operational plans, and considering the geographical dispersion of the university. In the results of Hadi Tabar's research, the component of flexibility and accountability is mentioned, and from this perspective, it is very consistent with the present study results (Hadi Tabar, 2017).

In addition, the present results are in excellent agreement with the research results of Abolghasemi (2017), Daniel (2020), Sharp (2012), and Sharifi and Zhang (2001). Subcategories of human resource value creation include meritocracy and succession, pay-as-you-go payment system, support of senior managers, increase of the interaction and inter-unit communication, and increase of people's participation in macro-decisions.

Farjad et al. (2016) also mentioned the component of support that is consistent with the present results from this perspective. In addition, the current results are consistent with the results of the research of Sarlak (Sarlak, 2016), Daniel (Daniel, 2020), Joyner (Joiner, 2019), Ilieva (Ilieva, 2018), Anas Al-Hadid (Anasy, 2016), Sharp (Sharpe, 2012), and (Goldman, 1995). On the other hand, dynamism, leadership style, attitude, talent management of individuals, leadership skills to resolve existing conflicts, and the ability to make bold and quick decisions are subcategories of organizational leadership. In the results of Zare's study, the component of organizational leadership and its impact on organizational agility is pointed out and, from this perspective, is in line with the results of the present work (Zare, 2013).

It should be noted that the present results match the results of Farjad (2016), Ilieva (2018), Joiner (2019), Memarzadeh (2014), Sharpe (2012), and Atoz Consulting Group. In addition, the subcategories of strategic agility of managers include monitoring and evaluating performance, having systemic thinking, being committed to the organization's vision, risk, and crisis management, and having team-building skills. Feizi's results mentioned the component of risk and commitment to risk, which referred to the component of teamwork similar to the present study results (Feizi, 2020). In addition, the present outgoings are consistent with the results of Ilieva (2018) and Sharpe (2012).

The subcategories of information and communication technology management are upgrading and integrating information systems, promoting information security and targeted development of information technology in the university, and providing software and hardware facilities. In Abolghasemi's work, the information technology component was also mentioned, which is consistent with the results of the current study, from this perspective (Abolghasemi, 2017). In addition, the present results are consistent with the results of Ilieva (2018), Jai (2017), Ridwadono (2019), Sanatigar (2017), Sharifi (2001), Sharpe (2012), Taghavi (2015), Ulfat (2009), Zhen (2021), and Atoz Consulting Group. Subcategories of training and empowerment of faculty members and staff named updating the topics of educational disciplines, standardization of educational programs, and strengthening participation in research activities. The present results are consistent with the results of Ilieva (2018), Goldman (1995), Sharpe (2012), Nikbakht (2013), and Sanatigar (2017). On the other hand, the subcategories of establishing knowledge management are increasing the general knowledge of the university, increasing the technical knowledge of the university, and reviewing and amending the administrative, financial, educational, and research regulations. Based on the results of our research, all had a great harmony with the results of research by Ghiasi (2020), Hadi Tabar (2017), Jai (2017), Joiner (2019), and Taghavi (2015). In addition, attracting new staff and faculty members,

upgrading and updating the organizational structure, strengthening the welfare facilities, students, and laboratories are subcategories of strengthening the university infrastructure.

In Ahmadi-Asl's study, the component of structural modification and removal of obstacles to the progress of structures was pointed out, which is consistent with the present study results from this perspective (Ahmadi Asl, 2019). In addition, the present results are consistent with the research results of Ilieva (2018) and Joiner (2019) and the dynamic model of organizational agility. It should be mentioned that commitment to ethical issues and professional ethics, establishing a culture of learning, implementing a culture of trust and commitment, and developing agility are subcategories of academic culture. In the results of Mahdieh's study, organizational learning was also mentioned, and from this perspective, it is consistent with the results of the present study (Mahdieh, 2020). In addition, the present results are consistent with the results of Abolghasemi (2017), Ghiasi (2020), Hadi Tabar (2017), Joiner (2019), and Memarzadeh (2014).

5. Conclusions

This study identified the factors affecting organizational agility in the University of Petroleum Industry. After reviewing the relevant research, the main factors affecting organizational agility, including organizational leadership, academic culture, knowledge management, information technology management, university infrastructure, strategic agility of managers, training and empowerment of members, organizational value creation, and organizational agility, were identified. On the other hand, all corresponding 13 hypotheses were formulated and tested. Considering the confirmation of all the hypotheses raised during the causal relationships between the research models, the model presented in the present study has sufficient validity to be established in the mentioned university. Therefore, relevant managers can improve the organization's agility by applying the results of the present study and implementing the components provided. The most critical element in promoting organizational agility is organizational leadership.

Thus, it is reasonable to resolve existing conflicts using dynamism, leadership style, attitude, and leadership skills. Moreover, managing the individuals' talent and making bold and quick decisions affect organizational leadership. Therefore, sensitivity in choosing the PUT director is one of the critical issues to consider. Another critical factor in promoting organizational agility is the value creation of human resources, facilitated by meritocracy and succession. The selection of human resources appropriate to the work environment and related activities has an influential role in promoting organizational agility.

There is an urgent need for the support of senior managers and the provision of a payment system commensurate with performance to maintain the valuable forces of the organization. As relevant managers increase their interaction between units, the likelihood of individuals participating in major decision-making will increase, and employees will become familiar with the various aspects of management that are necessary to replace and determine future managers. If managers have strategic agility, promoting organizational agility will not be out of reach, which will be possible by monitoring and evaluating performance and having systemic thinking. Management's commitment to the organization's vision and team-building skills can certainly be significant for organizational risks and crises. Laying the groundwork for promoting organizational agility depends on information and communication technology management, training and empowerment of faculty and staff, and strengthening the university infrastructure. By integrating information systems and enhancing information security, university administrators will overcome organizational agility challenges.

Further, capable managers will compete with other world-renowned universities by purposefully developing information technology in the university and providing software and hardware facilities, which can be achieved by updating the curriculum and standardizing training programs. It should be noted that updating and enriching strategic and operational plans and strengthening participation in research activities also promote organizational agility.

One of the practical pillars in upgrading and improving the organizational structure is attracting new staff and faculty members. PUT managers can strengthen the university infrastructure and provide the necessary basis for implementing organizational agility by strengthening the welfare facilities, students, and laboratories. Moreover, to achieve the goals of organizational agility, managers must pay special attention to the geographical distribution of the PUT in three provinces and four cities of the country. In the meantime, there is a need for university culture to accept all active people in the PUT. In the case of commitment to ethical issues and professional ethics, the culture of

trust and commitment is implemented. In turn, it has positive effects on promoting organizational agility. In addition to creating and promoting organizational culture, there is a need to establish knowledge management. Relevant managers can prepare the ground for improving the organization's agility by increasing general and technical knowledge of the university and reviewing and amending the administrative, financial, educational, and research regulations.

Finally, the PUT will expect organizational agility by implementing the above. The oil industry improves how things are done by identifying the strengths and weaknesses of the organization and increasing flexibility and adaptability to the environment. Regarding the value creation of human resources, it is suggested that managers of the PUT strive for meritocracy and succession by making efforts to increase the participation of individuals in significant decisions. Regarding organizational leadership, it is suggested that the relevant officials of the PUT pay more attention to the management of people's talents along with the leadership's dynamism, style, and attitude because leadership skills to resolve existing conflicts and the ability to make bold and quick decisions can lead to the establishment of agility in the university. Regarding the strategic agility of managers, it is suggested that managers of the PUT manage the risk and crisis of the university by monitoring and evaluating organization performance and having systemic thinking. Managers' commitment to the organization's vision and their team-building skills are essential factors in establishing agility in the PUT.

Appendix A

The corresponding questionnaire is presented in Table 3.

Table 01: Corresponding questionnaire

Dimensions	Questions	Very low	Low	Medium	High	Very high
Organization agility	Establishing agility in PUT leads to identifying the strengths and weaknesses of the organization.					
	Flexibility and adaptability to the environment will be created following the establishment of organizational agility.					
	Implementing agility in PUT leads to improving the process of doing things.					
	Competence and achieving goals are possible with the establishment of agility in PUT.					
	One of the crucial pillars in creating agility in PUT is optimal accountability to individuals.					
	Increasing people's satisfaction is a positive consequence of establishing agility in PUT.					
	Creating agility in PUT leads to updating and enriching strategic and operational plans.					
	Creating agility in PUT requires attention to the geographical dispersion of the university.					
Value creation of human resources	Value creation of human resources leads to meritocracy and succession in the university.					
	The payment system is commensurate with the performance arising from the value creation of human resources.					
	The value creation of human resources in the university depends on the support of senior managers.					

Dimensions	Questions	Very low	Low	Medium	High	Very high
	Increasing interaction and inter-unit communication facilitate agility implementation in PUT.					
	Implementation of agility in PUT is accelerated by increasing the participation of individuals in macro decision-making.					
Leadership	Dynamics, style, and leadership attitude are essential in achieving agility in PUT.					
	Establishing agility in PUT will be achieved by managing the talent of individuals.					
	Leadership skills to resolve existing conflicts are one of the crucial pillars in achieving agility in PUT.					
	The ability of the leader of the organization to make bold and quick decisions in solving academic challenges is essential.					
Managers' strategic agility	Monitoring and evaluating the performance of university administrators is mandatory.					
	Having systemic thinking facilitates the creation of agility in PUT.					
	Managers' strategic agility is measured by the degree of commitment to the organization's vision.					
	Risk and crisis management are essential for the survival and sustainability of any organization.					
	Having team-building skills leads to agility in PUT.					
IT	Upgrading different systems and keeping up with new technologies is necessary to create agility in PUT.					
	Upgrading and integrating information systems and promoting information security in the university are essential.					
	Targeted development of information technology in the university effectively creates agility in PUT.					
Training and empowerment of members	Establishing agility in PUT can be achieved by providing software and hardware facilities.					
	Updating the topics of the educational disciplines is necessary to improve the members' skills.					
	Standardization of educational programs leads to increasing the knowledge of active members in the university.					
	Training and development of social and communication skills lead to agility in PUT.					

Dimensions	Questions	Very low	Low	Medium	High	Very high
	Strengthening participation in research activities empowers members.					
Knowledge management	Increasing the general knowledge of the university is necessary to create agility in PUT.					
	Establishing agility in PUT is facilitated by increasing the technical knowledge of the university.					
	It is necessary to review and amend the administrative, financial, educational, and research regulations to implement agility in the university.					
Organizational structure	Attracting new staff and faculty members will strengthen the university infrastructure.					
	In order to create agility in PUT, it is necessary to strengthen the relationship with the industry and develop practical and professional education.					
	Upgrading and updating the organizational structure accelerate the creation of agility in PUT effectively.					
	Establishing agility in PUT can be achieved by strengthening welfare, student, and laboratory facilities.					
University culture	Commitment to ethical issues and professional ethics reflects the rich academic culture.					
	Establishing a learning culture helps implement agility in PUT.					
	Promoting a culture of knowledge to implement agility in PUT is important.					
	Creating agility in PUT will be possible by creating a culture of trust and commitment.					
	Establishing a culture of developing agility capabilities is a prerequisite for implementing agility in PUT.					

Appendix B

The following details about the PUT statistical society under study are listed in Table 4.

Table 4: The details of the statistical society of PUT.

Degree	Diploma		Associate Degree		BS		MS		PhD		Results	
Workplace	M	F	M	F	M	F	M	F	M	F	Total	Participant
Headquarters	8	1	6	7	18	11	21	8	7	0	87	49
PUT of Ahwaz	81	6	10	2	26	7	6	7	17	2	164	85

Degree	Diploma		Associate Degree		BS		MS		PhD		Results	
PUT of Abadan	62	3	5	4	10	14	6	1	15	2	122	48
PUT of Tehran	11	1	6	1	8	10	5	8	12	0	62	25
PUT of Mahmoudabad	14	0	6	0	13	4	8	1	1	0	47	22
Total	176	11	33	14	75	46	46	25	52	4	482	229

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