Requirements of Effective Curriculum in Higher Education from the Perspective of Complex Adaptive Systems through a Strategic Approach

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Abstract

Objective: The purpose of the present study was to achieve the requirements of an effective curriculum in higher education from the perspective of a complex and adaptive system with a strategic approach.

Method: It was applied in terms of its purpose and qualitative in terms of its implementation method. The research method was descriptive-analytical. To identify the themes, the data exploration method based on Strauss and Corbin (1990), thematic analysis, and to determine the content validity, content analysis was used. The identification of the basic and organizing themes of the first and second levels was addressed by considering the research of education experts and the collection of field and library data and information. Higher education, as the source of transformation and development of science and technology, in an effort to improve its quality and maintain its meaningful survival and sustainable development, is inevitably subject to continuous adaptation and adaptation to existing and emerging conditions, improvement and, if necessary, fundamental transformation. Higher education, as a complex, adaptive system, is inevitably required to provide and guarantee maximum effectiveness in internal, external and institutional dimensions in order to implement its goals and missions. The Mask Yoda software (Maxqda, 2022) has been used to analyze the data in the qualitative section.

Findings: The results indicate the identification of 3 first-level themes, 10 second-level themes and 15 basic themes.

Conclusion: The findings of this study show that the curriculum must adopt a strategic approach to achieve this goal. That is, it must be able to provide a strategic response for maximum adaptation and have a strategic change accordingly in order to achieve strategic success. In this regard, the curriculum as a whole and each of its elements (objectives, content, teaching methods, and evaluation...) must have the flexibility and agility necessary for response, change, and strategic success. On the other hand, the effectiveness of the curriculum in the three dimensions of internal, external, and institutional effectiveness is the criterion for the strategic success of the curriculum in a strategic educational environment such as higher education.

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Introduction

A continuous and multiple cycle of influence and impact on the whole, the parts, the components, and the environment of the higher education system is underway.In this way, the whole, part, components and the environment create themselves and others in a chaotic pattern, or in Edgar Moran's words, they organize themselves into an ecosystem (Turkzadeh, 2024). In the meantime, higher education must fulfill functions such as nurturing and developing human capital, producing and applying science, and social and cultural development in the context of complex systems that suddenly exhibit irregular and emerging behaviors, have porous and permeable boundaries, and move on the edge of chaos, using the curriculum. In the meantime, the quality and effectiveness of curricula find a strategic position. In the simplest definition, effectiveness can be defined as the extent to which an action achieves the intended goal. Of course, effectiveness has a general concept. Peter Drucker defines the aforementioned term as follows: effectiveness means doing things that are appropriate or appropriate (Stoner and Freeman, 2023). In another definition, according to Howe and Miskel, (2013), effectiveness is the degree to which practical results match the expected results of an organized action. In simpler terms, in an effectiveness study, the extent to which goals are achieved is measured. Of course, it seems that a step further should be taken to define the concept of effectiveness in education, meaning that effectiveness will be achieved in a training course when educational needs are clearly identified, an appropriate program is designed to meet the needs, the designed program is implemented correctly, an appropriate evaluation of the training process is carried out, and finally the goals are achieved.

One of the ways to ensure the quality of education is to evaluate the effectiveness of education. Evaluation provides the necessary feedback for improving and continuing the effectiveness of the curriculum (Terkzadeh et al., 2020). According to UNESCO (1993), the effectiveness of the education system depends on a well-designed curriculum that should: Be able to attract the young generation in the future labor market and also equip them with the skills required by employers. Not only provide technical content (technical skills), but also help learners learn how to deal with new challenges (coping skills) and prepare them for lifelong learning. When individuals enter the labor market, they should be provided with a set of basic skills needed to move from one job or field of work to other jobs or fields. Provide free access to the curriculum for all individuals without restrictions and entry requirements.

The real effectiveness of a curriculum should be considered from a functional perspective, which is referred to as external effectiveness. External effectiveness refers to the effectiveness of learning from education in situations outside the education process where the learner works or lives (Bazargan, 2020). In this sense, the more changes in the behavior and actions of learners at the end of educational activities are in line with the predetermined goals, the

more external effectiveness the educational program has (Mohsenpour, 2018). In other words, external effectiveness shows the extent to which the curriculum is effective in responding to the environment. On the other hand, the ultimate goal of higher education is to provide students with appropriate opportunities to acquire knowledge, skills, abilities, attitudes, beliefs, and values, in a way that helps them be effective and productive for themselves and society, and this comprehensive growth should be reflected in the curriculum of universities. Therefore, the curriculum in higher education should be prepared in a way that meets the needs of society, trains the specialized workforce needed by the labor market, and creates the necessary skills for them to perform their jobs efficiently and to deal with job and environmental challenges. And of course, provide these facilities to students without setting any preconditions (including gender, race, etc.) (Mehrmohammadi, 1997).

At the same time, external effectiveness requires the realization of the internal effectiveness of the program. There are different perspectives on internal effectiveness. Norouzi et al. (2012) consider internal effectiveness to be the extent to which the existing program is effective in responding to the desired benefits and expectations of learners. This means that internal effectiveness is related to the responsiveness of these programs to the needs and benefits of students. This is because in the discussion of internal effectiveness, the perspective of stakeholders and stakeholders within the organization is important. Here, we can discuss the elements of the curriculum and the level of student satisfaction with them, as well as whether these elements are in line with the desired benefits of learners or not. On the other hand, according to Turkzadeh et al. (2014, p. 126), the organization must have sufficient internal coherence and coherence between the different components in practice in order to be able to achieve the desired goals, in which case we can say that the organization has internal effectiveness. In other words, to what extent has the university been able to achieve the desired quality of processes and the realization of its set goals? Yemeni (2011, p. 49) considers the internal effectiveness of the university system as an academic effectiveness and believes that this effectiveness is the result of interactive communications between various components that are effective in quantitative and qualitative changes. It is as a result of these communications that the university is talked about as quantitative efficiency (increasing students, faculty, equipment, etc.) and qualitative efficiency (increasing scientific capabilities). Therefore, internal effectiveness considers the degree of achievement of internal organizational goals and the proportionality and qualitative conformity of the output with respect to the predetermined goals. Of course, establishing the proportionality of the university's internal performance with the goals, benefits, and programs of the university, paying attention to the feedback of internal processes and functions, and facilitating the implementation of internal processes are effective in measuring internal effectiveness (Taghizadeh, 2022). The internal effectiveness of the university is evaluated through the extent to which quantitative and qualitative goals are achieved and the resources used for this purpose. Some of the factors that affect the internal effectiveness of the

university are: students, professors, content to improve the internal quality and efficiency of the university system so that a dynamic balance is created between the professor (and his training process), content (and its design process), and students (and his selection and processing process) (Yemani, 2003).

The result or consequence of internal and external effectiveness is institutional effectiveness, which expresses the impact of the educational system on the realization of missions and missions and matters such as efficiency, general usefulness of the system, and external image (Terakzadeh et al., 2014, p. 126). In fact, institutional effectiveness is the process of collecting and analyzing documents in 8 cases, the fit between the missions, objectives, and defined goals of the organization and the actual results obtained from its programs and activities (Sheldon et al., 2008). in the field of institutional effectiveness, it should be seen whether the goals and objectives of the curriculum have been accurately defined and outlined and whether these goals are proportional to the results resulting from the implementation of the curriculum? Have the efforts made in the curriculum been in line with the goals of higher education and has the university been able to successfully operate in the surrounding environment by realizing those goals through the curriculum? Has the realization of the goals and missions of the university, through the implementation of the curricula, led to a change in the structure of processes and ultimately the development of the country?

Looking at the current state of the curricula, it is easy to see that in the field of institutional effectiveness, these programs have not been very successful. In proving this claim, we can point to the very small role of the humanities curricula in the cultural, social and economic progress of the country, as well as in promoting the country's scientific and research position in the field of humanities in the world. The prerequisite for achieving each type of effectiveness is to pay attention to the higher education curriculum as a complex and harmonious system that must be viewed with a strategic approach. This issue is explained below.

Complex Adaptive Systems Complex adaptive systems are dynamic systems that are able to adapt, grow, and evolve simultaneously (coevolution) with a changing environment (Serena Chan, 2001). The complex adaptive systems perspective is based on the assumption that the world is full of systems such as climate systems, safety systems, and complex social systems, and that these complex systems are constantly adapting to their environment (National Institute for Public Health, 2010). Among the characteristics of such systems are the emergence of irregular and emergent behaviors, the existence of porous and permeable boundaries, the formation of multiple activity zones within the system, movement on the edge of chaos, and the self-organizing ecosystem. In fact, in these systems, activity zones are formed or determined for various reasons and methods. These zones create general constraints on the overall behavior, but they allow the system to move situationally in and between zones of activity as it progresses and develops. In this movement of zones, the system moves between a state of stable equilibrium and complete randomness, which is interpreted as the edge of chaos, that is, neither the concept and characteristics

of stability nor the concept and characteristics of chaos are suitable for showing the state and behavior of the system (Turkzadeh, 2024, p. 465). In other words, the characteristics of complex systems that are becoming more coherent include coevolution, connectivity, simple rules, repetition (UK Institute of Public Health, 2010), learning, proportionality, nonlinear relationships, self-organization capacity, emergence, absorptive properties, fractality (Alhoff and Walchsky, 2002), decentralized control and, at the same time, a kind of ability to predict the future (Paul, 1999). It should be noted that the system.

Research Method

This research aimed to achieve the requirements of an effective curriculum in higher education from the perspective of a complex and adaptive system with a strategic approach. It was applied in terms of purpose and qualitative in terms of implementation method. The research method was descriptive-analytical. The data exploratory method based on Strauss and Corbin (1990) was used to identify the themes, and content analysis was used to determine the content validity. The identification of the basic and organizing themes of the first and second levels was addressed by considering the research of education experts and the collection of field and library data and information. Higher education, as the source of transformation and development of science and technology, in an effort to improve its quality and maintain its meaningful survival and sustainable development, is inevitably subject to continuous adaptation and adaptation to existing and emerging conditions, improvement and, if necessary, fundamental transformation. Higher education, as a complex and adaptive system, is inevitably required to ensure and ensure maximum effectiveness in internal, external and institutional dimensions in order to implement its goals and missions. The Yoda Mask software (Maxqda, 2022) has been used to analyze the data in the qualitative section.

Research Findings

Complex Adaptation in the Curriculum with a Strategic Approach

The strategic approach includes all the advantages of the contingency and systemic approaches, in the sense that it both pays attention to environmental factors and considers the comprehensiveness of the impact, interaction, and collectiveness of various factors. With a comprehensive and multidimensional view of issues, the strategic approach monitors its external environment and evaluates the internal conditions and factors of the system so that, while being in a superior position, with appropriate orientation, constructive and useful communication, adaptation, and management of the interactive environment, it can achieve the desired future in accordance with the situations and requirements. In fact, the strategic approach seeks to create and maintain the strategic fit of the system with the environment and the future. Strategic fit

means that the system achieves such internal and external integrity that, while responding to the demands of the future environment (which typically has a lot of complexity, ambiguity, and uncertainty), it also ensures its survival and development. Complexity arises due to the internal relationships and connections and interactions of components and elements within a system and between systems and its surrounding environment.

As stated above, higher education is considered a complex, adaptive system that is constantly adapting to its environment. From an educational perspective, it can be said that what must function well in this complex system and demonstrate appropriate adaptation to achieve the goals of the higher education system in its surrounding environment is the curriculum, which in fact, in a way, reflects the content of higher education. In fact, the higher education curriculum, by considering and following environmental conditions and requirements correctly, quickly and accurately, and also taking appropriate action against them, seeks to provide an appropriate response to the conditions and requirements in order to ensure the success and meaningful survival (useful and effective) of itself and the higher education system in the future. Here, it is necessary that each of the factors and elements of the curriculum (as a complex, adaptive system) be organized and act in line with this strategic response so that the curriculum as a whole can handle the appropriate strategic response.

In this regard, it is necessary to provide the grounds for the strategic response and, as a result, achieve strategic fit for the curriculum. On the one hand, a strategic response requires strategic change, and on the other hand, it results from strategic success. The purpose of strategic change in the curriculum is its flexibility, dynamism, and correct and timely changeability in the conditions and requirements of the future environment. However, not every change is necessarily strategic or is equivalent to a strategic response. Rather, changes can provide the basis for a strategic response that achieves strategic success. The purpose of strategic success in the curriculum is its success in implementing and applying changes and the results obtained from them, in accordance with the conditions and requirements of the future environment and in line with meeting the requirements arising from it. The realization of these three will lead to the development and formation of the general characteristic of strategic fit of the curriculum. As can be seen in Figure (1), these three dimensions and their resulting consequences (strategic fit) interact and react with each other simultaneously. This means that they simultaneously build, support, and nourish each other.
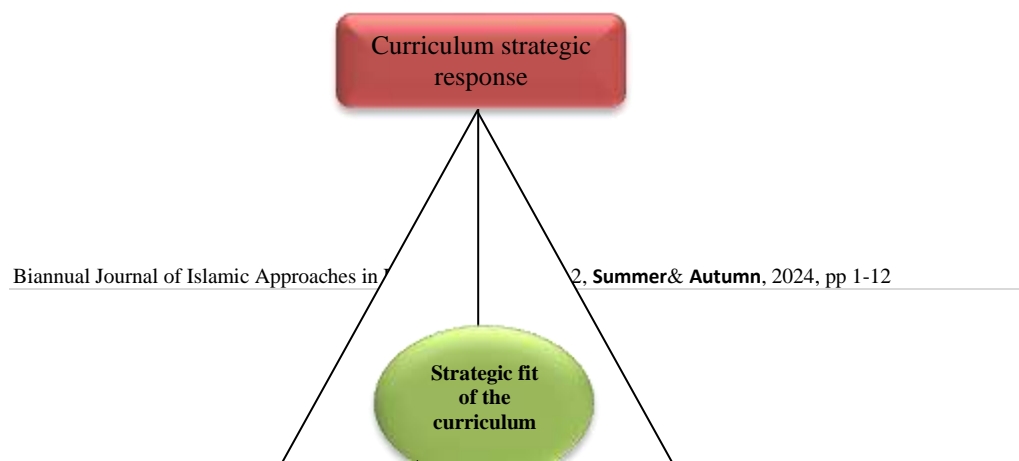
Figure (1) Strategic fit of higher education curriculum

Table 1. Contents of an effective curriculum in higher education from the perspective of a complex, adaptive system with a strategic approach

Comprehensive theme	Organizing themes		Basic themes
	First level	Second level	
			- Addressing a strategic issue in a strategic field.
		Strategic response	**- S2 (Strategy to the power of two) due to the resulting complexities and diversity**
			- Managing the surrounding environment and the future.
			- Responding to the demands of the future environment.
		Strategic change	**- Transforming into a complex, adaptive system in conceptual, structural and functional aspects**
Strategic Approach			**- Responding appropriately and appropriately to current and future environmental changes**

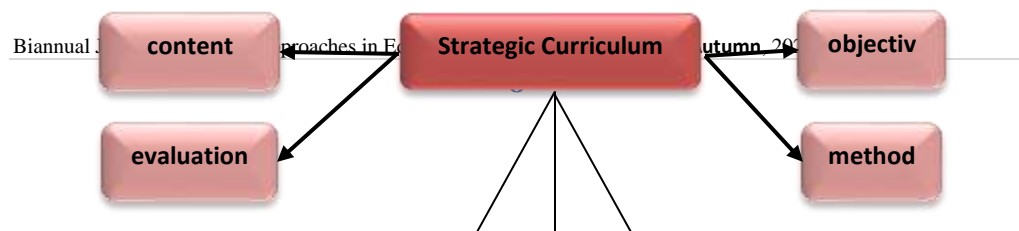|			
Effective curriculum from the perspective of a complex, adaptive system with a strategic approach	Strategic Curriculum	Strategic success	**- Using a strategic leadership approach as the basis for work.**
		Strategic objectives	**- Creating a state of dynamic interaction within oneself in order to change the future.**
		Strategic content	**- The need for content is tangible in different forms.**
		Strategic method	**- Integrated and mixed methods should be used.**
		Strategic evaluation	**- Monitoring and evaluation help to better see flaws and deficiencies.**
			- Evaluativeness helps to correct existing weaknesses.
	Effective Curriculum	Institutional effectiveness	**- The curriculum and its dimensions and elements take on a strategic form.**
		External effectiveness	**- Providing a strategic response to the environment and achieving strategic success in this way.**
		Internal effectiveness	**-It must maintain and improve its interaction and adaptation to the environment.**

Figure (1). Effective curriculum from the perspective of a complex, adaptive system with a strategic approach

Discussion and conclusion

A strategic view of the higher education curriculum is actually addressing a strategic issue in a strategic context. A state that is so-called S2 (strategy to the power of two). Due to the complexities and diversity resulting from such a condition, higher education must necessarily transform into a complex, adaptive system in terms of concept, structure, and function in order to manage the surrounding environment and the future, and base its work on the use of a strategic leadership approach. With this approach, the higher education curriculum, while creating a state of dynamic interaction within itself, in order to change the future, must maintain and improve its interaction and adaptation to the environment in order to achieve strategic fit. That is, it must achieve such internal and external integrity that, while responding to the demands of the future environment, it also appropriately ensures its survival and increasing development. The strategic fit of the higher education curriculum is achieved when it has the ability to provide a timely and appropriate response to current and future environmental changes. In other words, it can provide a strategic response to the environment through strategic change and achieve strategic success in this way. In such a situation as described above, in order for the higher education curriculum to be able to provide a strategic response to its environment and future and achieve strategic success, it must be able to achieve the three aspects of effectiveness (internal, external, and institutional). Because in fact, the realization of all three aspects mentioned, according to their definition and scope, is the criterion for the strategic success of a curriculum and the basis for its strategic response to the environment and the future. To achieve this, it is necessary that the curriculum and its dimensions and elements

take on a strategic state so that the higher education curriculum, as a strategic system, can be capable and responsive in its strategic environment (S2 state) and achieve strategic success and effectiveness (total-environment-future-oriented).

Among the limitations and factors that slow or make it difficult to implement strategic changes in university programs are: Traditional structures and resistance to change, including (adherence to old syllabi and fixed programs of the ministry and resistance of the faculty to changing teaching methods and course content). Time - consuming approval of new courses or changes to syllabi in councils and commissions. Excessiv erigor in do cumentation and formal agreements. Lack of skilled professors in interdiscip linary and emerging fields. Overreliance on short-term tenured professors. Insufficient budget to update laboratories, workshops, and educational technology. Limited investment in multimedia educational content. Lack of use of big data and educational evaluation research to modify programs. Teaching skills that are irrelevant or outdated to real market needs. Concerns about replacing or changing value - laden and indigenous content.

Components that strengthen and make strategic changes successful: Management support and will at the national and university levels. Alignment of programs with labor market needs and global scientific developments. Active participation of professors in research and educational innovation. Flexibility of university structures in accepting new courses and syllabi. Development of partnerships between universities, industry, and society. Investment in educational technology and blended learning infrastructure and use of dynamic and data-based evaluation systems.

Suggested actions to overcome limitations and take advantage of success factors: Development of flexible and modular syllabi that can be updated quickly. In service training in teaching technology, new and interdisciplinary skills. Use of smart learning systems to monitor student and course performance. Use of feedback from graduates and employers to modify content and skills. Equipping laboratories, skill workshops, and virtual education platforms. Integrating cultural values with scientific innovation in courses. Encouraging joint interdisciplinary and inter-university projects and...

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