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Article

Factors Improving Childbearing Intention among Young Adults in the Context of Low Birth Rate in China: ISM Approach

Yuanyuan Xu[1,2] *, Jamiah Manap[1], Siti Fardaniah Abdul Aziz[1], Shuying Yao[2] & Haibao Liu[3]

[1]Human Development Program, Centre for Research in Psychology & Human Wellbeing, Faculty of Social Science & Humanities, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
[2]School of Marxism, Fuyang Normal University, China, 100# Xihu Road, Yingzhou District, Fuyang, Anhui 236000, PR China
[3]School of History Culture and Tourism, Fuyang Normal University, China, 100# Xihu Road, Yingzhou District, Fuyang, Anhui 236000, PR China

*Corresponding Author: P115791@siswa.ukm.edu.my

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Abstract: In the context of China's low fertility rate, critical success factors (CSFs) to enhance young adults' childbearing intentions are considered an important means to achieve sustainable population development in China. The aim of this paper is to propose a methodology to identify critical success factors (CSFs) for enhancing young adult's childbearing intentions in China. A total of 21 critical success factors (CSFs) were identified through a literature review and input from academic and industry practitioners. This paper adopts an Interpretative Structural Modeling (ISM) approach to establish the interrelationships among these factors, which not only helps to understand the relative relationships among the critical success factors, but also identifies their interdependencies in practical applications. In addition, the importance of the factors in enhancing childbearing intentions was identified through analysis based on their drivers and dependencies. It was found that improvement of fertility perception is the direct influential factor that motivates young adults to increase their childbearing intentions. This paper demonstrates the application of the proposed model in practice, using Chinese young adults as an example. The study can help academics, government regulators and practitioners to emphasize the implementation of measures to increase childbearing intentions.

Keywords: Interpretive Structural Modelling (ISM); childbearing intention; young adults; critical success factors; low birth rate

Introduction

The number of new births in China has been declining annually since 2016, and China experienced negative population growth for the first time in over 60 years in 2022 (Jing et al., 2022; YearBook, 2016-2022). With urbanization, young adults' childbearing intention has become more personalized, autonomous and independent. The diversification of young adults' living styles and increased social mobility opportunities made young adults' childbearing intentions undergo significant changes, showing prominent personalized characteristics (Wagner Bernardes & Marin, 2023). Under the influence of traditional and modern values, young adults generally hold rational and diversified attitudes toward childbearing intention (Bueno, 2020). Young adults are already of reproductive age, so the research on young adults' childbearing intention has become a priority in the study of demographic change (Bueno, 2020; Lardou et al., 2021; Zhang et al., 2022).

Childbearing intentions can be divided into three levels: the ideal number of children, which is an attitude towards childbearing. Sociocultural factors primarily influence it and rarely to be changed (Wang et al., 2019). The second is the desired number of children, meaning the number of children people wish to have. This concept is often used to reflect the aspect of fertility demand. The third is intended family size, referring to the number of children individuals plan to have after considering various factors that may affect their fertility. (Chen & Yip, 2017). This concept is the most commonly used because it relates to actual reproductive behavior. (Beaujouan & Berghammer, 2019).

This study employs an explanatory structural modeling (ISM) approach to explore the critical success factors in enhancing young adults' childbearing intentions in China's low birth rate. ISM serves as a systematic analytical tool that analyzes the hierarchical structure and relative importance of factors by analyzing their interactions.

Literature Review

1. The Impact of Education on Childbearing Intentions

Education is a factor that cannot be ignored in improving childbearing intentions among young adults (Cheng & Hsu, 2020). Tuition waiver helps reduce the burden of educating children, encouraging more families to have higher childbearing intentions (Bose et al., 2024). The popularization of fertility knowledge and the provision of on-campus extended-hours services have a positive effect on the childbearing intentions (Du et al., 2024). By popularizing fertility knowledge, young adults can have a good command of the knowledge of childbearing process and related support policies. Thus, it brings about their childbearing intentions (Martins et al., 2024). Providing on-campus extended-hours services and interest classes reduces parents' time pressure and promotes children's all-around development, growing young adults' childbearing intentions (Zhang, 2023). In addition, upgrading educational equity and heterogeneity in education can also increase childbearing intentions (Aguliera & Nightengale-Lee, 2020). When families perceive equity in the distribution of academic resources, their worries about childbirth will diminish, thus growing their childbearing intentions (Miller et al., 2020).

2. The Influence of Maternity Allowance and Related Support Policies on Childbearing Intentions

The government conducts policies to support fertility, such as maternity allowances and free post-natal rehabilitation services, contributing to encouraging young adults' childbearing intentions (Feng, 2024). Providing maternity allowances for newborns and the exemption of childbirth expenses lessen the economic burden on families (Zhu et al., 2022). Free post-natal rehabilitation services can help new mothers recover quickly, strengthening their confidence and intentions (Sarkar et al., 2021).

Maternity benefits are a family policy tool to reduce the cost of childbearing. According to fertility theory, as the level of economic development rises, the actual level of childbearing in families is lower than the level of willingness to bear children because of the high cost of childbearing, resulting in a "fertility deficit" (Raute, 2019). Maternity subsidies can compensate families for the cost of childbearing, reduce the burden of childbearing on families, narrow the "fertility deficit" and increase childbearing intentions (Wesolowski, 2020).

3. The Influence of Working Environment on Childbearing Intentions

Long hours of overtime work also harm human health, and reducing overtime work helps human health to a certain extent (Bae et al., 2022). From the employees' point of view, the company not working overtime can effectively improve the employees' work-life balance and their quality of life(Bhende et al., 2020). Overtime work is also one of the leading causes of family conflicts and tensions between husband and wife. Reducing overtime work is conducive to lowering employees' stress and physical and mental health, which, to a certain extent, helps to increase the fertility rate (Abendroth, 2022). Alleviating the conflict between fertility and employment enables women to decide on their own whether or not to have children or how many children to have on the premise of obtaining an independent economic status and realizing their values, which will help

to increase women's childbearing intentions (Jing et al., 2022). Western countries, which have long had low fertility rates, have taken various measures to improve the fertility rate of the population of appropriate age (Delbaere et al., 2020). Among them, dual-wage family policies, which help women to balance their "family-work" responsibilities and thus promote women's labor force participation, have had a significant effect on raising fertility rates (Kim & Hong, 2021).

4. The Influence of Economic Conditions on Childbearing Intentions

The critical success factor of improving childbearing intention among young adults is to improve social welfare, which is an essential factor in raising the fertility rate of the population because it can enhance the economic strength of families and reduce their financial burden, thus raising the childbearing intention (Lappegård et al., 2022). Increasing employment opportunities and income for women of childbearing age. The government can promote female employment through various measures and boost women's income levels, thus reducing the pressure of childbirth and economic pressure (Fang & Chan, 2024; Finlay, 2021). Improvements in economic conditions include stabilizing population's income level housing prices, lowering the cost of education, providing families with better conditions for childbirth (Liu et al., 2020). In the era of negative population growth, the personal income tax deduction system for childcare costs is the key to reducing the financial burden of childcare for families and thus increasing fertility intentions (Hart & Galloway, 2023). As the economy continues to grow and families' financial situation improves, their economic expectations for the future will become more optimistic, leading to a greater childbearing intention (Bi, 2024).

Methodology

The objective of this paper is to develop a new conceptual framework for understanding the critical success factors of improving childbearing intention among young adults in the context of low birth rate in China. Not much research work has been carried out in this area, and hence, the findings of this research will guide the organizations to re-consider their framework towards childbearing intention. Young adults aged 20-29 in China were selected as the research subjects in this study because they represent a demographic group at a critical decision-making stage regarding childbearing intentions (Hisham & Akqmie, 2024). Young adults will be the main childbearing force in the next five years, and their childbearing intentions will play a crucial role in predicting the size and structure of the future population. Studying the childbearing intentions of young adults made it possible to explore in depth how these factors influence their fertility decisions. The Interpretive Structural Modeling (ISM) methodology has been used in this study to establish the interrelationships between the identified success factors for improving childbearing intentions among young adults and to identify the success factors with the maximum driving and dependence power. The introduction to ISM methodology and steps involved in the approach are discussed in the following sections of the paper.

The Interpretative Structural Modelling Method (ISM) is a widely used system science method (Kumar & Goel, 2022)，making it particularly suitable for examining the factors influencing childbearing intentions among young adults. It is derived from Structural Modeling, which is a method that first breaks down the system to be analyzed into subsystems such as factors and elements by sorting. Then analyses the factors and the direct binary relationships between the factors (Vinodh, 2021). Maps this conceptual model into a directed graph, and through Boolean logic operations, finally reveals the structure of the system and gives a simplified hierarchical directed topology that does not lose the overall functionality of the system, and premise in the form of a minimal hierarchical directed topology diagram (Thakkar et al., 2006).

ISM method is a research method in system science, which is an effective research method to build a bridge between natural and social sciences (VenkatesaNarayanan & Thirunavukkarasu, 2021), an effective method for exploring socio-cultural issues like fertility decision. ISM modelling requires the use of Boolean matrix operations or relatively complex topological analysis, which is a typical research method in system science. However, by interpreting specific nodes and directed edges, these analyses fall within the scope of the social sciences (Kumar & Goel, 2022).

ISM has a wide range of applications, from international issues such as energy issues to regional economic development, enterprises and even personal range issues (Singh & Bhanot, 2020). It plays a very important role in revealing the structure of the system, especially in analyzing the content structure of teaching resources and carrying out research on the design, development of learning resources and the exploration of the teaching process mode (Lallement et al., 2014). It is also a specialized research method in the study of educational technology (Mathiyazhagan et al., 2013). In the field of social science, it plays a critical role in structuring complex problems and visualizing their interrelations, which is invaluable for understanding the factors influencing young adults' childbearing decisions in China. The figure below illustrates the process of preparing the ISM model for identifying the key factors that determine young adults' childbearing intentions, as adapted from Yu et al. (2023). The figure provides a step-by-step representation of the methodology employed in this study.

ISM has a great advantage over describing the nature of the system in tables, text, mathematical formulas (Ullah & Narain, 2021). Because it presents the conclusions in the form of a hierarchical topological diagram, this presentation has an intuitive effect, and the causal hierarchy of the system factors can be understood at a glance through the hierarchical diagram, the ladder structure (Singh & Bhanot, 2020). According to Yadav et al. (2022), the advantages of ISM can be concluded as follows:

i. Structured complex problems
   ISM can help understand and analyze the relationship between elements in a complex system, structure complex problems, and make them easier to understand and handle. By organizing factors into clear levels, ISM aids in identifying root causes and prioritizing interventions.
ii. Systematic thinking
   By establishing a structured model, ISM promotes systematic thinking and helps to comprehensively consider all aspects and interrelationships of the problem. It contributes to analyze the relationship between various factors affecting young adults' childbearing intentions.
iii. Graphical representation
   ISM uses graphical methods to show the relationship between elements making the complex interplay between these elements intuitive and easy to understand, facilitating effective communication and explanation of how different factors contribute to shaping childbearing intentions.
iv. Clear hierarchy
   ISM can decompose complex systems into different levels, clarify the relationship between each level, and help solve problems layer by layer, which enable researchers to identify root causes and address them to improve young adults' childbearing intentions.
v. Participatory method
   ISM is usually achieved through expert group discussion and consensus, which helps to brainstorm and make full use of the knowledge and experience of all parties. The analysis was more comprehensive after diverse expertise like demographers, sociologists, and policymakers participated.

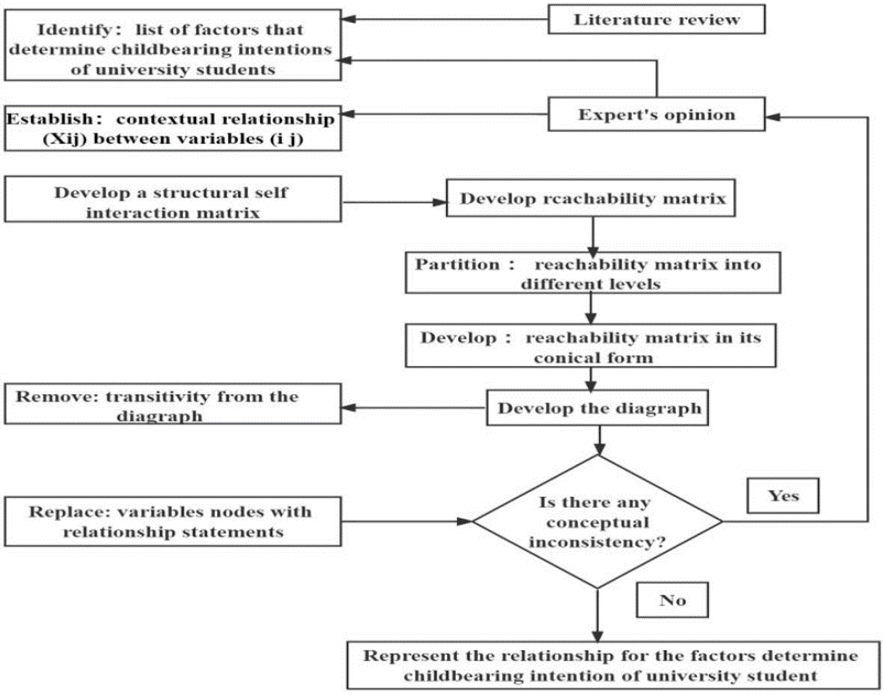

Figure 1. Flow Chart for Preparing the ISM Model of the Key Factors Determining Childbearing Intention of Young Adults Modified from (Yu et al., 2023)

The Findings

1. Determine Influencing Factors

According to the literature review and four experts who researched childbearing intention, the critical success factors of improving childbearing intention among young adults were identified. Twenty success factors were identified: S_1 = exemption of tuition fees, S_2 = dissemination of fertility knowledge, S_3 = reduction of the burden on children's education, S_4 = provision of time-delayed services in school, S_5 = heterogeneity of education, S_6 = provision of interest classes, S_7 = enhancement of educational equity, S_8 = maternity allowance newborn, S_9 = free postnatal repair, S_{10} = exemption from maternity expenses. S_{11} = reduction in gender discrimination, S_{12} = stress reduction in the workplace, S_{13} = provision of paid leave, S_{14} = extension of holiday duration, S_{15} = enhancement of employment rates, S_{16} = media promotion of fertility, S_{17} = vigorous economic development, S_{18} = tax deduction for childbirth in personal income tax, S_{19} = reduction of costs associated with childbirth and parenting, S_{20} = lower house prices and rents. These 20 critical success factors of improving childbearing intention among young adults in China from five different dimensions: education, maternity coverage, work, media, and economy dimension as shows in Table 1.

Table 1. CSF dimensions of improving childbearing intention among young adults in China

Factors Dimension	Specific Factors
Education Dimension	1. Exemption of tuition fees
	2. Dissemination of fertility knowledge
	3. Reduction of the burden on children's education
	4. Provision of time-delayed services in school
	5. Heterogeneity of education
	6. Provision of interest classes
	7. Enhancement of educational equity
Maternity Coverage Dimension	8. Maternity allowance newborn
	9. Free postnatal repair
	10. Exemption from maternity expenses

Work Dimension	11. Reduction in gender discrimination 12. Stress reduction in the workplace 13. Provision of paid leave 14. Extension of holiday duration 15. Enhancement of employment rates
Media Dimension	16. Media promotion of fertility
Economy Dimension	17. Vigorous economic development
Value Dimension	18. Tax deduction for childbirth in personal income tax 19.Reduction of costs associated with childbirth and parenting 20. Lower house prices and rents 21. Improvement of fertility perceptions

2. Build Reachable Matrix

A matrix approach is employed to construct the relationship between the items at each dimension indicated above, resulting in an adjacent matrix that is based on the relationship between each element. The relationship between each member in the adjacency matrix is determined as follows: The value is 1 if there is a relationship between element i and element j; otherwise, it is 0. An interactive relationship exists between element i and element j. If the discrepancy is little, both F_{ij} and F_{ji} will be assigned a value of 1. However, if the discrepancy is significant, the larger value will be allocated a 1 and the smaller value will be assigned a 0. An adjacency matrix was created to represent the relationship between the aforementioned elements that influence the reproductive intentions of Chinese teenagers. Given the potential for mutual interaction, there are both direct and indirect links between each element. During the analytical phase, we prioritize direct linkages and disregard indirect interactions to simplify the calculations. The relationship between the two is established by the examination of current literature and the application of expert analysis methodologies. The provided Reachable Matrix is displayed in Table 2.

Table 2. Reachable matrix of critical success factors of improving childbearing intention

	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}	S_{11}	S_{12}	S_{13}	S_{14}	S_{15}	S_{16}	S_{17}	S_{18}	S_{19}	S_{20}	S_{21}
S_1	0	0	1	0	0	1	1		0	1	0	0	0	0	0	0	0	0	1	0	1
S_2	0	0	0	1	0	0	0	1	1	1	0	0	1	0	1	0	0	0	0	0	1
S_3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
S_4	1	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	1
S_5	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1
S_6	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1
S_7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1
S_8	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1
S_9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1

S_{10}	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1
S_{11}	0	1	0	1	0	1	0	0	0	0	0	1	0	0	1	0	0	0	1	0	1
S_{12}	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1
S_{13}	1	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	1
S_{14}	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1
S_{15}	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1
S_{16}	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
S_{17}	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
S_{18}	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
S_{19}	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1
S_{20}	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
S_{21}	1	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

*The table above shows the reachability matrix of the model. The adjacency matrix represents the direct relationship between elements, and the reachability matrix represents whether the transfer between elements will bring indirect

3. Establish Hierarchical Relationships

To determine the relation between the objects at each of the aforementioned dimensions, a matrix technique is used. The Reachable Matrix states that it's critical to determine each component's level. Element 1 is regarded as the highest-level element when the intersection of R(Fi) and A(Fi) equals R(Fi). This element needs to be marked out as soon as it is retrieved. The grade distribution of the remaining items should subsequently be obtained using the same methodology. Table 3 presents the exact iteration strategy.

Table 3. Level of critical success factors improving childbearing intention

Level	Factors
Level 1	Improvement of fertility perceptions
Level 2	Media promotion of fertility, Stress reduction in the workplace, Dissemination of fertility knowledge, Reduction of the burden on children's education, Reduction of costs associated with childbirth and parenting
Level 3	Enhancement of educational equity, Vigorous economic development, Tax deduction for childbirth in personal income tax, Lower house prices and rents, Maternity allowance newborn, free postnatal repair, Exemption from maternity expenses
Level 4	Enhancement of educational equity, Reduction in gender discrimination, Provision of paid leave, Extension of holiday duration, Provision of time-delayed services in school, Exemption of tuition fees, Heterogeneity of education, Provision of interest classes

4. Establish Interpretative Structure Model

Interpretative structure model of the Critical Success Factors Improving Childbearing Intention among Young Adults (Figure 2) was set up based on the Level of Critical Success Factors Improving Childbearing Intention (Table 3). According to the Interpretative Structure Model (Figure 2), the critical success factors improving childbearing intention among young adults have a four-level multi-level ladder structure. This model explains the logical relationship between the Critical Success Factors that improve childbearing intention among young adults from shallow to deep:

i. The first level of critical success factors improving childbearing intention among young adults includes improvement of fertility perceptions, which represents a direct success factor on the intention for childbirth.
ii. The second level of the critical success factors improving childbearing intention comprises media promotion of fertility, stress reduction in the workplace, dissemination of fertility knowledge, reduction of the burden on children's education and reduction of costs associated with childbirth and parenting. It still represents relatively superficial factors that influence the subjective norm of childbearing intentions.
iii. The third tier of factors consists of enhancing educational equity, vigorous economic development, the tax deduction for childbirth in personal income tax, lower house prices and rents, maternity allowance for newborns, free postnatal repair, and exemption from maternity expenses. This demonstrates that these factors impact the second level of the critical success factors.

The fourth level factors are enhancement of educational equity, reduction in gender discrimination, provision of paid leave, extension of holiday duration, provision of time-delayed services in school, exemption of tuition fees, heterogeneity of education, and provision of interest classes. These factors are the underlying factors improving childbearing intention among young adults in the context of the low birth rate in China.

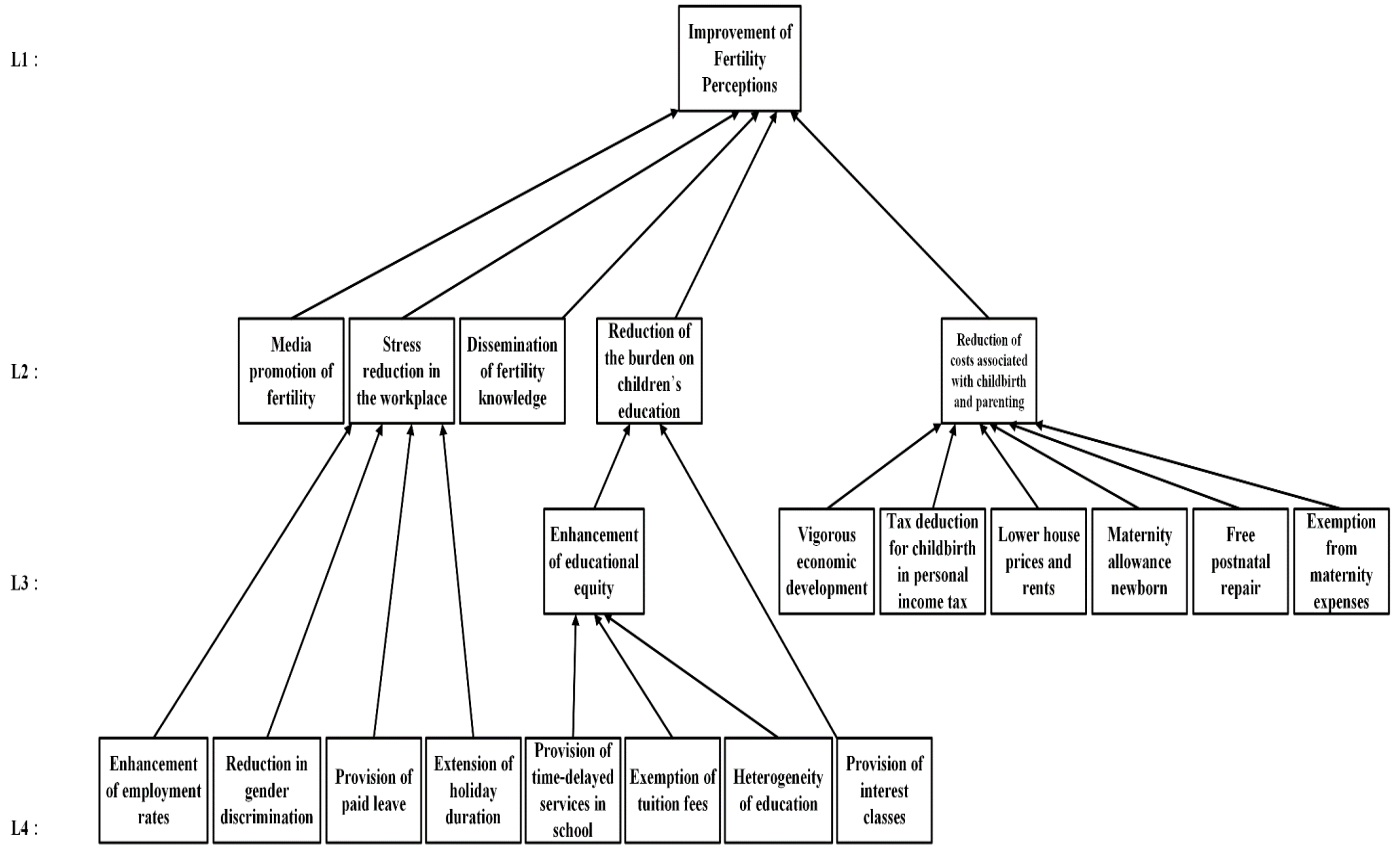

Figure 2. Interpretative structure model of success factors improving childbearing intention among young adul

Discussion

The CSFs for childbearing intention among young adults show considerable challenges, because of the context of low birth rate in China. Otovescu and Otovescu (2019) pointed that negative population growth marks the dawn of a new era, and it is irreversible as fertility rates will not fall back. As a result of the negative population growth momentum, the birth rate enters a downward spiral. The Chinese government and decision-makers must have the knowledge of the importance of the various CSFs for improving the childbearing intentions among young adults. In the present study, an ISM model was developed considering the 21 critical success factors improving childbearing intention among young adults based on a thorough literature review and experts' opinion. An Interpretative Structure model of success factors improving childbearing intention among young adults was developed and the inter-relationship among all these drivers was analyzed using the ISM methodology. Then, the 21 CSFs were iterated in 4 levels and the structure of ISM was developed, as shown in Figure 2.

1. Surface Direct Factor Analysis

According to Figure 2, it can be concluded that the superficial direct factor that affects the childbearing intentions among young adults is the improvement of childbirth perceptions. Therefore, policies to promote childbearing intention should focus on accelerating the transformation of childbearing concepts. Improvements in concepts may include positive media publicity and guidance on childbearing to eliminate fear of childbearing and increase confidence in family and social support. These direct factors are the most critical because they directly affect individual childbearing decisions.

2. Analysis of Indirect Factors at The Middle Level

According to Figure 2, the intermediate indirect CSFs that affect young adults' childbearing intention are media promotion, stress reduction in the workplace, dissemination of fertility knowledge, reduction of the burden on children's education, reduction of costs associated with childbirth and parenting. In order to promote these indirect factors to increase young adults' childbearing intentions, the third layer of the model can be used to obtain methods, namely, enhancement of educational equity, vigorous economic development, tax deduction for childbirth in personal income tax, lower house prices and rents, maternity allowance for newborns, free postnatal repair, exemption from maternity expenses.

3. In-Depth Analysis of Underlying Factors

According to Figure 2, the deep-seated fundamental factors that affect young adults' childbearing intentions are enhancement of educational equity, reduction in gender discrimination, provision of paid leave, extension of holiday duration, provision of time-delayed services in school, exemption of tuition fees, heterogeneity of education, and provision of interest classes. Therefore, to increase the childbearing intention among young adults, it is important to consider both equity in education and the provision of a better working environment and income from work.

Conclusion

This study identified 21 critical success factors improving childbearing intention among young adults based on expert and literature review and used the ISM approach to identify the internal links and hierarchies of these factors. Based on the ISM model, direct success factors and fundamental factors improving childbearing intention were identified. The government and policymakers should take measures to enhance young adults' childbearing intentions from the perspective of promoting educational equity, reducing work pressure, increasing employment rates, and reducing the costs of childbirth and raising children.

In this study, only 21 CSFs were considered. However, other CSFs may have been missed from this model but still have an impact on young adults' childbearing intentions. Furthermore, including more CSFs in additional trials is likely to produce superior results. The current model was constructed by taking into account the assessments of a demography expert, which may be biased and affect the accuracy of the final results. Future research could benefit from a more diverse group of experts to enhance the reliability of the

results. The ISM methodology, while effective in identifying factor hierarchies, does not validate the model quantitatively. In the future, the authors hope to validate this model using structural equation modeling (SEM) methodology.

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