

VIETNAM GLOBAL COMPETITIVENESS INDEX 4.0-2018: ASSESSMENT AND PROBLEMS

Nguyen Thi Phuong Mai¹, Hoang Minh, Nguyen Vo Hung

National Institute for Science and Technology Policy and Strategy Studies

Abstract:

On 16th October 2018, World Economic Forum (WEF) made public the Global Competitiveness Index Report 4.0-2018 which ranked Vietnam 77th among 140 nations and economies of the world (with 58 points). The paper provides a global review of the GCI 4.0-2018, an analysis and clear presentation of some aspects of Vietnam GCI 4.0-2018 and then proposes some solutions for improvement of these indexes in close future.

Keywords: Competitiveness capacity; Industrial revolution 4.0; Innovation; Innovative eco system; GCI 4.0.

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1. General introduction of Global Competitiveness Index 4.0

1.1. Origin of Global Competitiveness Index 4.0

The 4th Industrial Revolution (IR 4.0) is expected to create hard-to-guess changes where all the nations and economies have opportunities to make leaps and fast moves forwards. IR 4.0 is “*offering new opportunities for enterprises, governments and individuals*”², and, at the same time “*bringing a threatening period of diverging and polarizing development inside and between economies and societies*”³. The formula of development of going-behind countries based on industrialization through advantages of cheap labors and absorption of foreign offered technologies cannot ensure success in the new context. The factors having helped set up competition capabilities could now get lower roles and competitiveness in long visions and get governed and impacted by new factors.

In this context, World Economic Forum (WEF) by 2018 had made basic adjustments for structure and calculation methods of the previously offered global competitiveness and provided a new set of indexes called *Global*

¹ Author's contact email address: npmai.vn@gmail.com

² WEF Report GCI 4.0, 2018 (WEF), page v.

³ As above noted

Competitiveness Index 4.0 (GCI 4.0) for studying and evaluating competitiveness of nations and economies in IR 4.0 context.

In practice, GCI 4.0 was initiated since 2015 on basis of ideas firstly offered by Prof. Klaus Schwab (WEF) and guided by Prof. Xavier Sala-i-Martin (Columbia University). The authors of this paper had conducted a deep and exhaustive study of documents and proven data, consulted experts from research institutes, international organizations, NGOs, central banks and governments for technical aspects and notions for integration of newest theories and indexes into the set of GCI 4.0⁴.

GCI 4.0-2018 was designed to reflect and to cover numerous sectors and factors which impact competitiveness. Nevertheless, WEF also recommended that it is only a kit of tools for evaluation of competition capabilities but not a unique and perfect set of tools. In the Report GCI 4.0-2018, WEF applied new methodologies and made backward calculations of GCI 2017 which were used as benchmarks for the 2018 outcomes of calculations. The WEF recommended not making comparison of the outcomes of calculations of GCI 4.0-2018 to the ones of the old calculations.

1.2. Scope and senses of Global Competitiveness Index 4.0

GCI 4.0-2018 integrate factors for evaluation of competitiveness, previously built and newly introduced, which play roles of levers for pushing and leading productivity and growth. GCI 4.0-2018 includes 12 pillars: 1) Institutions; 2) Infrastructure; 3) Information technology (IT) applications; 4) Macro-economy stability; 5) Health; 6) Skills; 7) Market of products; 8) Market of labor; 9) Finance system; 10) Market scale; 11) Dynamism of enterprises; and 12) Innovation capabilities.

GCI 4.0-2018 make accents on human resources, innovation, fast and flexible capacities of resilience and response. They are factors which lead and define parameters of economic success in IR 4.0.

According to WEF visions, for responding to challenges from IR 4.0, the nations and economies need suitable mechanisms to reduce risks of financial crisis and to adjust socio-economic impacts from innovation. The successful economies in the era of IR 4.0 need to gather the following 4 factors:

(i) Resilience capabilities: They are capabilities to build up backup options

⁴ In Report GCI 2017-2018 (realized by the old method and made public on 26th September 2017), WEF made one annex (Annex E) to introduce the draft of a new methodology called GCI 4.0 with calculation results and ranks tested with the new method for purpose to introduce it and to get initial feedbacks.

and economic mechanism to prevent financial crisis or mass unemployment and to respond to external shocks.

(ii) Fast response capabilities: They are capabilities of enterprises, policy makers and labors to fast adapt to new operational modes and to maximally use offered opportunities to produce goods or to supply services in new ways.

(iii) Innovative eco system: It is the environment where the innovation gets stimulated in all the levels and by all the involved parties, supported and commercialized. According to WEF visions which are also the approach by National Innovation System (NIS), the innovative eco system, in fact, includes all the pillars since the innovative eco system still needs factors of human resources, allocation of optimally qualified staffs, availability of venture investments and specific finance products, good infrastructure, availability of information-communication technologies (ICT) and institutional aspects for development of ideas, IP protection and large scale markets for promotion of new ideas. However, for focused analysis and evaluation, WEF considers Pillar 11 and Pillar 12 as factors causing direct impacts to innovation.

(iv) Focus for human development: It is the human-centered view for economic development where the human factors are the crucial resource for wealth. In this view, any policy causing bad impacts to potentials of human factors would reduce the economic growth in long term vision. Therefore, the planning of policies need to ensure the speed of changes and to introduce new technologies for the final destination of better living conditions of the human.

With the above noted methodology and approach, WEF recommends every nation should maximize its total score through every index and should not pay attentions only to the position ranking. In its nature, GCI 4.0 provides all the nations and economies with equal grounds for their own path of development. All of them should have a global approach instead of focused attentions for certain individual factors. One successful pillar is unable to compensate other low effective pillars. For example, high investments for technologies not coupled with suitable investments for digital skills would not lead to meaningful outcomes of productivity.

1.3. Some identifications by WEF for global trends and some problems from GCI 4.0

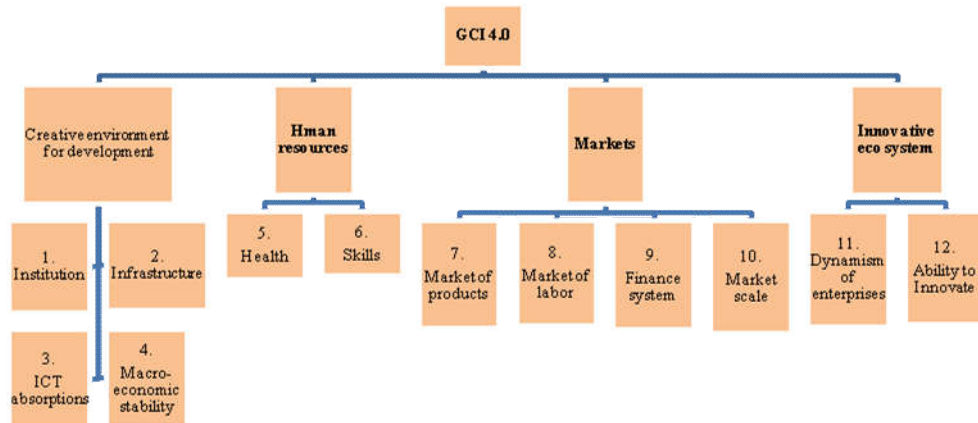
- All the nations and economies need to focus investments on global measures for promotion of competitiveness to maintain growth and income rates.

- Competitiveness should be enhanced for higher resilience capacities of the economy facing external shocks.
- National economy should be opened well for higher growth and competitiveness but the nations and economies should also support vulnerable groups to avoid the left-behind situation in globalization process.
- Technological development is the important driving factor of economic growth, enhancement of productivity and dynamism of national economy. However, technologies cannot give the solution for all the problems including education, health, management and transport infrastructure. For many economies with low competitiveness, the core reason leading to low growth remains the well known aspects such as institution, infrastructure and labor skills. Among them, the weakness in institutional sectors remains the factor preventing competitiveness and development of many nations. Then, the institutional environment should get great attentions for development to become a major actor of higher productivity.
- In context of fast shifts of IR 4.0, the capabilities for fast response, flexibility and adaptation of all the concerned actors including individuals, governments and enterprises would be found as the leading components of success.
- There is no common formula for innovation for all the nations and economies. The innovation is the have-to-be component of advanced economies and the priority of emerging nations. However, majority of these nations are still struggling to make the innovation become a meaningful driving force for growth. Many nations have the limitation of their innovation capabilities only in few local fields. As assistance for nations to settle the difficult problem of innovation, GCI 4.0 indicates clearly innovation guiding factors, from identification of ideas up to commercialization of products. Many factors, among them, are intangible such as cultural factor.

2. Frame of indexes, method of evaluation and ranking

2.1. Frame of indexes

The WEF Report GCI 4.0-2018 provided evaluations and ranked competitiveness of 140 nations and economies in the world. GCI 4.0-2018 offers groups of indexes, pillars and other sub-indexes highly different from the ones of GCI 2017. GCI 4.0-2018 classifies 4 big groups with 12 pillars (as noted in Item 1.2 above) and 98 sub-indexes.



Source: WEF Report GCI 4.0-2018

Figure 1. Frame of indexes by GCI 4.0-2018.

2.2. Groups of indexes and pillars

2.2.1. Index of creative environment for development

➤ Pillar 1. Institutions

The institutions are the official regulations (laws and enforcement mechanisms) and non-official regulations (practices) which make the frame of organization and operation of economic activities. Obviously, the institutions impact productivity mainly through mechanisms to offer favors and to reduce risks.

This pillar also reflects the feature of *capabilities of fast and flexible responses* necessary for nations and economies in IR 4.0.

➤ Pillar 2. Infrastructure

As rules, the nations and economies having better infrastructure would have higher level of wealth. Well developed infrastructure helps reduce transport and transaction costs and, at the same time, offers favorable conditions for transport of goods and movement of peoples, and for transfer of information inside the country and across borders. Good infrastructure ensures access to power and water supply which are necessary for modern economic activities.

➤ Pillar 3. ICT absorption

ICT allows to reduce transaction costs, accelerating speeds of exchange of information and ideas, enhancing effectiveness and to create innovations. ICT increasingly gets embedded into structure of economic activities and becomes a factor necessary for effective economic activities as power and transport infrastructures are.

➤ *Pillar 4. Macro-economic stability*

This pillar reflects *the capabilities of resilience* of nations and economies in IR 4.0 contexts. It shows the extent the public sectors can produce suitable measures of response from time to time and make investment in projects where private sectors are found unable to do.

Forecast inflation rates and stable public budgets help reduce uncertainties, drawing expected investments and enhancing business trusts which are also factors to enhance productivity. In addition, in a connected world where the capital can circulate fast, the loss of trust could lead to loss of capitals and then cause economic uncertainties.

2.2.2. *Indexes of human resources*

➤ *Pillar 5. Health*

This pillar reflects *the core human-centered features*. Here the health is interpreted not only as pains from diseases and handicap situations but in the broadest meanings of the word: physical, spiritual and social ones. A healthier individual would be higher productive and innovative. The society sees increasing trends to make more investments and education works with increasing life expectancy. Strongly developed childrens will have higher recognition level.

➤ *Pillar 6. Skills*

This pillar reflects *the capabilities of resilience* (capacities of humans to work, learn and adapt to changing ambiances) and *the human-center features* (skills the humans need to have for strong development in IR 4.0 contexts).

Education helps labor forces get high skills and capabilities. The population with higher level of education and qualification would have higher productivity because they are positioned better to carry out tasks and to transfer knowledge as well as to create new knowledge and applications in fast way.

2.2.3. *Index of market*

➤ *Pillar 7. Market of products*

Competition supports the enhancement of productivity through stimulation of innovations by enterprises where they are required to update products, services and organizational structure, to supply best possible products with most suitable prices.

This pillar also reflects *the capabilities of fast and flexible response*.

➤ *Pillar 8. Market of labor*

Good circulation of the market of labor would push up productivity through arrangement of labors where they get job positions suitable with their skills for better exploitation of their potentials. Through combining flexibility and protection of basic rights of labors, the market of labor can help enhance capabilities of resilience against shocks and re-arrange production activities for emerging segments, encourage labors to accept risks, attract and to hold talents as well as motivate labors to work.

This pillar also reflects *the capabilities of fast and flexible response* and *the human-centered features* (recognition of talents and respect of rights of labors)

➤ *Pillar 9. Finance system*

Finance system can push up productivity through three channels: turning of money savings to production capitals; improvement of allocation of capitals for most promising investments through supervision of borrowers and reduction of asymmetric information; and provision of effective payment systems. At the same time, it is necessary to issue suitable regulations to prevent finance institutions from financial crisis which may cause negative and long impacts to activities of investment and production.

This pillar also reflects *the capabilities of resilience* (including measures to reduce finance risks and resource crisis for a better response to external shocks).

➤ *Pillar 10. Market scale*

A large market scale may enhance productivity since the production costs have a trend to reduce for production of bigger mass of products. The large scale market also stimulates innovations. Since the ideas do not have competitive nature then there are more potential users, and it means a higher potential of benefits. Also, the large scale market has external elements which provide positive impacts for accumulation of human capitals. Then the transmission of created knowledge and technologies provides already added benefits for the market.

2.2.4. *Index of innovative eco system*

➤ *Pillar 11. Dynamism of enterprises*

This pillar reflects *the capabilities of fast and flexible response*. The private sector, dynamic and highly sensible, helps enhance productivity thanks to wills to accept risks, to test new ideas and then to produce innovative products and services. In a permanently disturbed environment where enterprises and

sectors get redefined regularly, the successful eco systems are those which have high capabilities of resilience against technological shocks and can recreate themselves continuously.

➤ *Pillar 12. Innovation capabilities*

Nations which can better cumulate knowledge and bring in chances for cooperation or connection have trends to bring in more opportunities for creation of innovative ideas and new business models. The latters, in fact, are driving forces for economic development.

This pillar also reflects the human-centered features with the evaluation of level of cooperation, interaction and creativity of the human.

2.3. Method of scoring, ranking and data sources

2.3.1. Scoring

The score calculated for GCI 4.0 is based on the total sum of points assigned to different levels of indexes. For the level of pillars and sub-pillars the points are calculated as the average value of the points gathered from all the components. For individual indexes (they are 98 in total), the scale of points ranges from 0 to 100 (the top is 100 points). The scale of 100 points is applied for GCI 4.0-2018 while the scale of points applied for GCI 2017 ranges from 1 to 7.

2.3.2. Weight

The weight assigned to indexes in GCI 4.0-2018 is much different from the one applied for GCI 2017. In GCI 4.0-2018 the weights are not required to be different between groups, pillars, sub-pillars and between groups of nations and economies (based on level of incomes) as it used to be.

The following table provides a comparison of weights between the new method of GCI 4.0-2018 and the old one of GCI 2017.

Table 1. Comparison of assignment of weights in GCI 4.0-2018 and GCI 2017

| GCI 4.0-2018 (new method) | GCI 2017 (old method) |
|---|---|
| No weights assigned to 4 groups of indexes | Different weights assigned to 3 groups of large indexes (Group 1 gains the weight in range of 20-60%, Group 2: 35-50% and Group 3: 3-30%) |
| Equal weights assigned to all the 12 pillars (every pillar gains a weight of 8.3% of the total gained scores) | Every pillar in groups of indexes gains the equal or unequal weight, subject to pillars |

| GCI 4.0-2018 (new method) | GCI 2017 (old method) |
|--|---|
| Sub-pillars in a pillar gain equal weights | Sub-pillars may gain equal or non-equal weights, subject to sub-pillars |
| The same system of weights is applied commonly for nations and economies | Different weights assigned to nations and economies subject to level of incomes |

Table 2. Comparison of sub-groups of indexes, pillars, number of component indexes and weights of pillars in GCI 4.0-2018 and GCI 2017

| Pillars | Number of pillars | Weights | Pillars | Number of pillars | Weights |
|--|-------------------|-------------|--|-------------------|---------------|
| GCI 4.0-2018 | | | GCI 2017 | | |
| Group of indexes for Creative environment for development | | | Group of indexes for basic requirements | | 20-60% |
| Pillar 1. Institution | 20 | 8.3% | Pillar 1. Institution | 21 | 25% |
| Pillar 2. Infrastructure | 12 | 8.3% | Pillar 2. Infrastructure | 09 | 25% |
| Pillar 3. ICT absorptions | 05 | 8.3% | Pillar 3. Macro-economic environment | 05 | 25% |
| Pillar 4. Macro-economic stability | 02 | 8.3% | Pillar 4. Health and primary education | 10 | 25% |
| Group of indexes for Human resources | | | Group of indexes for Enhancement of effects | | 35-50% |
| Pillar 5. Health | 01 | 8.3% | Pillar 5. Training and higher education | 08 | 17% |
| Pillar 6. Skills | 09 | 8.3% | Pillar 6. Effects of the market of products | 16 | 17% |
| Group of indexes for Market | | | | | |
| Pillar 7. Market of products | 08 | 8.3% | Pillar 7. Effects of the market of labor | 10 | 17% |
| Pillar 8. Market of labor | 12 | 8.3% | Pillar 8. Development of the market of finances | 08 | 17% |
| Pillar 9. Finance system | 09 | 8.3% | Pillar 9. Level of availability of technologies | 07 | 17% |
| Pillar 10. Market scale | 02 | 8.3% | Pillar 10. Market scale | 04 | 17% |
| Group of indexes for Innovative eco system | | | Group of indexes for Innovation and expertise | | 5-30% |
| Pillar 11. Dynamism of enterprises | 08 | 8.3% | Pillar 11. Expertise in business | 09 | 50% |
| Pillar 12. Innovation capabilities | 10 | 8.3% | Pillar 12. Innovation | 07 | 50% |
| Total | 98 | 100% | Total | 114 | 100% |

2.3.3. Data sources

GCI 4.0-2018 uses data from results of the Executive Opinion Survey by WEF by 2018 for 41/98 indexes (42%). The remaining indexes use statistical data (hard data) of nations and economies collected from international organizations including World Bank or soft data from surveys or evaluations conducted by international organizations. In comparison to GCI 2017, the number of indexes using data from the Executive Opinion Survey in GCI 4.0-2018 is considerably much lower than the one of GCI 2017 (GCI 2017 used data from this Survey for 82 indexes which make 72%).

The 2018 Executive Opinion Survey conducted by WEF from January to April 2018 for 140 nations and economies. 52 nations and economies take part in this survey in on-line ways. Vietnam has 78 experts to participate in the 2018 Survey (90 experts participated in the 2017 survey). The survey questionnaires had 148 questions divided into 15 different sessions. Almost all the questions had the score scale from 1 to 7, similarly to the Executive Opinion Surveys conducted by WEF in previous years.

2.3.4. Calculation of GCI 4.0-2017

As providing references for GCI 4.0-2018, WEF applied this method of calculation for backward calculation of results of GCI 2017 (backcasting). Data used for GCI 4.0-2018 are the most updated ones available from nations and economies. For calculation for GCI 4.0-2017 the data are taken one year back.

3. Results of calculation of GCI 4.0-2018 of Vietnam

3.1. Ranking of GCI 4.0 of 21018 of Vietnam

According to made evaluations, the score of GCI 4.0-2018 of Vietnam is 58 points (increased by 0.1 point in comparison to the one of 2017, by the same method of calculation) and ranked 77-th among 140 nations and economies (3 ranks lower than the one of 2017 by the same method of calculation).

Globally, Vietnam has a low score and rank for DCI 4.0. Among 12 pillars of GCI 4.0-2018, the best rank is of Pillar 10 - Market scale - (70.9 points, 29-th rank) and the lowest rank is of Pillar 7 - Market of products (52.1 points, 102-nd rank).

Table 3. Scores and ranks of GCI 4.0-2018 of Vietnam.

| | Scores | Ranks |
|--|------------------|----------------|
| GCI 4.0 | 58 (+0.1) | 77 (-3) |
| Group of indexes for Creative environment for development | | |
| Pillar 1. Institution | 49.5↓ | 94 |
| Pillar 2. Infrastructure | 65.4↓ | 75 |
| Pillar 3. ICT absorptions | 43.3↑ | 95 |
| Pillar 4. Micro-economic stability | 75= | 64 |
| Group of indexes for Human resources | | |
| Pillar 5. Health | 81↑ | 68 |
| Pillar 6. Skills | 54.3↓ | 97 |
| Group of indexes for Market | | |
| Pillar 7. Market of products | 52.1↓ | 102 |
| Pillar 8. Market of labor | 55.6↑ | 90 |
| Pillar 9. Finance system | 62.3↓ | 59 |
| Pillar 10. Market scale | 70.9↑ | 29 |
| Group of indexes for Innovative eco system | | |
| Pillar 11. Dynamism of enterprises | 53.7↓ | 101 |
| Pillar 12. Innovation capabilities | 33.4↓ | 82 |

Notes: In line of GCI 4.0, the figures in brackets are comparisons to GCI 4.0-2017 (applied with the same method used for GCI 4.0-2018), the sign “+” means “increase” in comparison GCI 4.0-2017, the sign “-” means “reduction” in comparison to GCI 4.0-2017; in the column of scores, the sign “↓” means “down” in comparison to GCI 4.0-2017, the sign “↑” means “up” and the sign “=” means “no change”.

Source: WEF Report of GCI 4.0-2018

In comparison to Global Innovation Index (GII) by WIPO which do evaluations for National Innovation System (NIS), the index for Innovative eco system by GCI 4.0 is less comprehensive and provides less global view. WEF marked it and then noted clearly “Innovative eco system is reflected in all the pillars”⁵ and not only in Pillar 11: Dynamism of enterprises, and Pillar 12: Innovation capabilities. Therefore, the indexes from GII and GCI show that the innovation needs to work not only with S&T sector but the involvement of all the sectors, fields and levels for active improvement of innovation capabilities and competitiveness.

⁵ WEF Report GCI 4.0-2018 (WEF), page 38.

3.2. Group of indexes for Innovative eco system in GCI 4.0-2018

The group of indexes for Innovative eco system in GCI 4.0-2018 includes two pillars: *Pillar 11: Dynamism of enterprises* and *Pillar 12: Innovation capabilities*. These two pillars in the Group of indexes for Innovative eco system have low ranks and lowering trends in comparison to GCI 4.0-2017.

As noted above, WEF marked clearly the Innovative eco system needs to have globally covering features including institutions, human resources, finance, good infrastructure, ICT availability, large scale market, encouragement for creation of new ideas. However, for focused analysis and evaluation, WEF considers the Group of indexes for Innovative eco system with the two pillars, namely *Pillar 11: Dynamism of enterprises* and *Pillar 12: Innovation capabilities* which cause direct impacts to innovation. These two pillars include the indexes for components in relation to business environment, institution, culture and etc., and not only are focused on innovation activities and results. With this approach, the group of indexes for Innovative eco system in GCI 4.0-2018 of Vietnam has the low score and rank.

3.2.1. Pillar 11 - Dynamism of enterprises

According to WEF, the private sector, dynamic and highly sensible, helps enhancing productivity thanks to wills to accept risks, to test new ideas and then to produce innovative products and services. In a permanently disturbed environment of IR 4.0 where enterprises and sectors get redefined regularly, the successful eco systems are those which have high capabilities of resilience to technological shocks and can recreate themselves continuously. Due to this feature, the dynamism of Vietnam enterprises is not highly evaluated.

Pillar 11 has 8 indexes and is divided into two sub-pillars, namely *Sub-pillar 11A: Administrative rules* (related to start-ups, bankruptcy and etc.) and *Sub-pillar 11B: Enterprise culture* (related to attitude towards business risks and etc.). For this pillar, Vietnam gains 53.7 points and gets the 101st rank.

In Pillar 11 the best index is *Index 11.08 Companies having breakthrough ideas* (44.7 score and 52nd rank). Here 6/8 indexes in Pillar 11 are low evaluated with ranks from 90 to 109. Namely, *Index 11.3 Rate of capital collection in bankruptcy* (78.4 points, 104th rank), *Index 11.4 Legal framework for bankruptcy* (46.9 points, 93rd rank) and *Index 11.7 Growth rate of innovative enterprises* (46.6 points, 110th rank).

3.2.2. Pillar 12. Innovation capabilities

According to WEF, nations which cumulate good knowledge and create more chances for inter-sectorial cooperation have trends to bring in more

opportunities for creation of innovative ideas and new business models, the latter being driving forces for economic development, than other nations. The evaluation of Innovation capabilities in GCI 4.0 includes 10 indexes which are divided into 3 sub-pillars, namely: *Sub-pillar 12A: Interaction and diversity* (4 indexes); *Sub-pillar 12B: Research and Development* (4 indexes) and *Sub-pillar 12C: Commercialization* (2 indexes). For this pillar, Vietnam gains 33.4 points and gets the 82nd rank.

Among the indexes of Pillar 12, *Index 12.5: Scientific papers* and *Index 12.8 Quality of research organizations* get the highest ranks (59th and 60th respectively).

For the range of ranks from 80 to 97, Vietnam has *Index 12.1 Level of diversity of labor forces* (52.6 point, 91st rank), *Index 12.4 Multilateral cooperation* including cooperation inside enterprise and between enterprises, between enterprises and universities in R&D activities (38.2 points, 97th rank), *Index 12.9 Smartness level of buyers* (36.2 points, 90th rank), *Index 12.6 Patent applications per million habitant* (3.4 points, 89th rank), *Index 12.3 International cooperation patent applications per million habitants* (3.4 points, 80th rank).

The indexes for components in *Pillar 12: Innovation capabilities* reflect a narrow and long term approach to innovation. With emphasized attentions for R&D, the calculation covers only the applications submitted to 5 main offices in the World; here the novelty of innovation is understood as *novelty for the world* and the innovation mainly is interpreted as continuation of R&D activities in linear models of innovation which cover the stages of scientific research, technological development, implementation of practical tests and commercialization of research results. In a long term vision, they are factors which define national competitiveness, but in short term and middle term visions this approach has to get further careful studies.

Scores and ranks of the pillars and indexes in the Group of Innovative eco system are noted in Table 4.

Table 4. Scores and ranks of the indexes in the Group of Innovative eco system

| Items | Indexes | Values | Score | Rank |
|-------|--|--------|--------------|------------|
| | Pillar 11. Dynamism of enterprises | | 53.7↓ | 101 |
| | <i>A. Administrative rules</i> | | | |
| 11.1 | Costs for set-up of start-ups (% GNI per capita) | 6.5 | 96.8↓ | 66 |
| 11.2 | Time for establishment of enterprises (days) | 22 | 78.4↑ | 104 |
| 11.3 | Rate of collection of debts in bankruptcy (cents/\$) | 21.8 | 23.5↓ | 109 |
| 11.4 | Legal frame for bankruptcy (score from 0 to 16) | 7.5 | 46.9= | 93 |

| Items | Indexes | Values | Score | Rank |
|-------|---|--------|--------------|-----------|
| | B. Enterprise culture | | | |
| 11.5 | Attitude toward business risks (score from 1 to 7) | 3.7 | 45.2↓ | 93 |
| 11.6 | Availability of attorney (score from 1 to 7) | 3.8 | 47.3↓ | 110 |
| 11.7 | Growth of innovative enterprises (score from 1 to 7) | 3.8 | 46.6↑ | 90 |
| 11.8 | Level of acceptance of risks and breakthrough innovative ideas by enterprises | 3.7 | 44.7↑ | 52 |
| | Pillar 12. Innovation capabilities | | 33.4↓ | 82 |
| | A. Interaction and diversity | | | |
| 12.1 | Diversity of labor forces (score from 1 to 7) | 4.2 | 52.6↓ | 91 |
| 12.2 | Development of industrial clusters (score from 1 to 7) | 3.7 | 45.2↓ | 77 |
| 12.3 | International cooperation patents (application/million inhabitants) | 0.12 | 3.4↓ | 80 |
| 12.4 | Multilateral cooperation (score from 1 to 7) | 3.3 | 38.2↓ | 97 |
| | B. Research and Development | | | |
| 12.5 | Scientific papers (H citation index) | 172.3 | 76.3↑ | 59 |
| 12.6 | Patent application (application/million inhabitants) | 0.20 | 3.4↓ | 89 |
| 12.7 | Expenditures for R&D (% GDP) | 0.4 | 12.5= | 76 |
| 12.8 | Quality of research organizations (global index) | 0.01 | 3.0↑ | 60 |
| | C. Commercialization | | | |
| 12.9 | Smartness level of buyers (score from 1 to 7) | 3.2 | 36.2↓ | 90 |
| 12.10 | Application of trademarks (application/million inhabitants) | 354.04 | 63.2↑ | 79 |

Source: WEF Report GCI 4.0-2018

3.3. GCI 4.0-2018 ranking of Vietnam and ASEAN countries

Globally, Vietnam has the scores and ranks lower than the ones of other ASEAN countries (Table 5). In calculations by GCI 4.0-2017 (new calculation method of GCI 4.0-2018) only 3 among 12 pillars of Vietnam show certain improvements, namely (*Pillar 3: ICT absorption; Pillar 8: Market of labor and Pillar 10: Market scale*) while other ASEAN countries have improvements in many pillars.

Table 5. GCI 4.0-2018 ranking of Vietnam and some ASEAN countries

| GCI 4.0 pillars | Singapore | Malaysia | Thailand | Indonesia | Philippines | Vietnam |
|--|-----------|----------|----------|-----------|-------------|-----------|
| | 2 (=) | 25 (+1) | 38 (+2) | 45 (+2) | 56 (+12) | 77 (-3) |
| Group of indexes for Innovative environment for development | | | | | | |
| Pillar 1. Institution | 3 | 24 | 60 | 48 | 101 | 94 |
| Pillar 2. Infrastructure | 1 | 32 | 60 | 71 | 92 | 75 |
| Pillar 3. ICT absorption | 4 | 32 | 64 | 50 | 67 | 95 |

| GCI 4.0 pillars | Singapore | Malaysia | Thailand | Indonesia | Philippines | Vietnam |
|---|-----------|----------|----------|-----------|-------------|------------|
| | 2 (=) | 25 (+1) | 38 (+2) | 45 (+2) | 56 (+12) | 77 (-3) |
| Pillar 4. Macro-economic stability | 42 | 1 | 48 | 51 | 43 | 64 |
| Group of indexes for Human resources | | | | | | |
| Pillar 5. Health | 1 | 62 | 42 | 95 | 101 | 68 |
| Pillar 6. Skill | 20 | 24 | 66 | 62 | 67 | 97 |
| Group of indexes for Market | | | | | | |
| Pillar 7. Market of products | 1 | 24 | 92 | 51 | 60 | 102 |
| Pillar 8. Market of labor | 3 | 20 | 44 | 82 | 36 | 90 |
| Pillar 9. Finance system | 5 | 15 | 14 | 52 | 39 | 59 |
| Pillar 10. Market scale | 27 | 23 | 18 | 8 | 32 | 29 |
| Group of indexes for Innovative eco system | | | | | | |
| Pillar 11. Dynamism of enterprises | 16 | 19 | 23 | 30 | 39 | 101 |
| Pillar 12. Innovation capabilities | 14 | 30 | 33 | 68 | 67 | 82 |

Notes: Figures in brackets are comparisons to GCI 4.0-2017 by the same method of calculation. The sign “+” means “up” and the sign “-” means “down”

Source: WEF Report GCI 4.0-2018

4. Comparison of GCI 4.0-2018 to some other indexes

4.1. Comparison to the index of Readiness for Future of Production (FOP)

Early 2018 WEF made public a diagnostic tool to help nations and economies recognize the actual readiness for the future of production while facing IR 4.0 and opportunities and challenges from it for new production and business systems. The kit of tools including 59 indexes with two large components provides evaluation of production structure and production leading factors.

The component of production structure includes two factors: (i) Complexity level of economy (1 index); and (ii) Scale of economy (2 indexes). Production leading factors are 6, namely: (i) Technologies and innovation; (ii) Human resources as capital (17 indexes); (iii) Global trade and investments (9 indexes); (iv) Institutional frame (4 indexes); (v) Sustainable resources (6 indexes); and (vi) Environment of demand (3 indexes).

According to outcomes of evaluation, in terms of Production leading factors, Vietnam is listed in the group of starting countries (including countries with

low scores in the two largely covering indexes) but close to the group of leading countries and high potential countries. This position allows to get better opportunities to get benefits from IR 4.0. Vietnam is ranked 48/100 on Production structure and 53/100 on Production leading factors. With the simple production structure and the position close to the group of *high potential* in terms of Production leading factors, Vietnam can get benefits from its going-behind position. Vietnam is not bound too tough to the existing production system (since Vietnam has a simple production structure).

In terms of Production structure, the index of complexity level of Vietnam gains 5.8/10 points and is ranked 17/100. Among 6 factors of this component, the best indexes of Vietnam are the ones for *Global trade and investments* (7.0/10 points; 13/100 rank); *Environment of demand* (5.2 points, 39/100 rank) and 2 low indexes *Technologies and innovation* (3.1 points, 90/100 rank) and *Sustainable resources* (4.6 points, 87/100 rank).

The methods of evaluation of Readiness for the Future of Production and GCI 4.0 are different but they remain similar in certain aspects (range of points from 0 to 100). Component indexes for evaluation are also coinciding in some aspects. Namely, FOP has also leading factors for *Institutions*, similarly to *Pillar 1: Institutions* of GCI 4.0 but the lower number of indexes (4 component indexes). In terms of *Human resources* there are 17 indexes for evaluation of actual and future resources of labor forces, similarly to *Pillar 7: Market of products*, *Pillar 2: Infrastructure* and *Pillar 9: Finance system*.

Particularly, the leading factors for *Technologies and innovation* in FOP include two main contents: (i) *Technological background*; and (ii) *Ability to Innovate*. *Technological background* includes 7 component indexes where 3 indexes deal with mobile subscribers, Internet users and etc., similarly to *Pillar 3: ICT absorption* in GCI 4.0. *Ability to innovate* includes 10 component indexes where 4 indexes are used in *Pillar 2: Innovation capabilities* of GCI 4.0, and 1 index is used in *Pillar 11: Dynamism of enterprises* and 2 indexes are used in *Pillar 9: Finance system*.

Therefore, basically, the evaluation by WEF of the Readiness for FOP in IR 4.0 and GCI 4.0-2018 are similar in many aspects according to which, particularly in terms of similar results for Innovative eco system/Ability to Innovate, Vietnam does not get high results.

However, WEF notes clearly, in fact, the Innovative eco system and Ability to innovate should be evaluated in a broader way which should be seen in many pillars and factors including human resources, financial resources,

infrastructure, institution, market and etc. Therefore, the low rank of Vietnam in both GCI 4.0 and FOP mainly due to the status of Innovative eco system (GCI 4.0) or Technologies and innovation (FOP) is not fully right.

4.2. Comparison to the index of Global Innovation Index (GII)

The GII is a kit of tools for evaluating and ranking Innovation capabilities of nations and economies which was built up jointly by World Intellectual Property Organization (WIPO), INSEAD (France) and Cornell University (USA) as a metric system for NIS.

In the system of evaluation by WIPO, Innovation is understood in a broad sense (including not only R&D based innovation but also non-R&D-based innovation) and covers many aspects of innovation including organizational structure, technical improvement by people and etc. This approach by WIPO reflects the view that Innovation capabilities of every nation have close links to the development level and operational effectiveness of its NIS and the links to other nations and economies. The GII calculates the effects of investments for innovation of nations and economies.

The GII of 2018, in total, includes 80 component indexes divided into 7 main pillars: 5 input pillars and 2 output pillars.

5 Input Innovation Pillars include: (i) Institution (political environment, legal environment, business environment); (ii) Human resources and research (education, higher education, research and development); (iii) Infrastructure (IT, general infrastructure, eco sustainability); (iv) Development level of credit market; (v) Development level of business (qualified labors, innovative links, knowledge absorption).

2 Output Innovation Pillars include: (i) Products of knowledge and technology (creation of knowledge, impacts of knowledge, and propagation of knowledge); (ii) Innovative products (intangible assets, innovative products and services, on-line creations).

Vietnam experiences modest ranks in terms of *Technologies and innovation* in FOP and *Innovative eco system* (*Pillar 11: Dynamism of enterprises and Pillar 12: Innovation capabilities*) in GCI 4.0-2018 which, according to WEF evaluations, are due to narrow points of view and direct approach by the team of authors to the topic of technologies and innovation. The evaluation method reflects the mindset and the view to innovation as the next steps of scientific research and technological development or STI model, namely science create knowledge, the use of knowledge creates technologies, the use of technologies creates innovations. This view,

according to many scientists, is too narrow (fitting only R&D based innovations) without considering the diversity and broader range of innovation activities where many innovations are not based on official traditions of scientific research and technological development and import technologies based innovations, and many other innovations which are based on efforts of searching measures to settle local difficult problems (innovations of this type are known as non-R&D Innovation, User-Innovation, Frugal Innovation and etc.). Thanks to this broader vision, WIPO and partner organizations proposed the approach of NIS for larger covering evaluation of innovation capabilities. According to this new approach, *it is necessary to take to consideration globally all the component factors of the system to evaluate national innovation capabilities*. According to the new WIPO method (GII 2018), Vietnam gains better results of evaluation (rank 45/126) than the one from WEF narrow approach of evaluation in WEF Report FOP 2018 (rank 90/100 for Technologies and innovation, and rank 77/100 for Ability to innovate) and in GCI 4.0-2018 (rank 82/140 for Pillar 12: Innovation capabilities).

5. Recommendation of solutions for enhancement of competitiveness in IR 4.0 for Vietnam

For improvement of competitiveness in IR 4.0 contexts and readiness for IR 4.0, in addition to improvement of innovation capabilities and development of Innovative eco system, the other factors of economy *need to be improved in global manner with involvement of all the sectors, fields and levels*.

Some measures should be focused for improvement of factors in those pillars where presently Vietnam has low scores and ranks, namely:

First, Further efforts for political stability, security and macro-economic stability which serve as background to improve competitiveness, to cope with challenges from IR 4.0 and to use maximally IR 4.0 offered opportunities.

Second, Further efforts for implementation of the Party and the Government guidelines for improvement of institutional structure, particularly Resolution No. 1, Resolution No. 19, Resolution No. 35 by the Government down to all the ministries, sectors and local governments (for improvement of indexes of institutions), efforts being focused to settle limitations in legal regulations and law enforcement, and enterprise management.

Third, Development of infrastructure, particularly links of roads, airport services, sea ports, power and water infrastructure, ICT infrastructure and ICT application for reduction of transaction costs and increase of speed in

exchange of information and ideas for higher effectiveness and creation of innovations.

Fourth, Enhancement of quality and effectiveness of training and vocational training activities, promotion of development of qualified and skilled human resources, interaction and cooperation skills to meet future changes, improvement of flexibility and adaptability of labor market.

Fifth, Further development of level of business activities, improvement of dynamism of enterprises, change of business culture, favorable conditions of innovative enterprises, development of Innovative eco system. Enterprise should be the leading topic in commercialization of results of research, application and innovation of technologies, particularly in IT sector. Namely, attentions should be focused for support and promotion of enterprises, research institutes and universities in activities for inventions and higher competitiveness based on intellectual assets./.

REFERENCES

In Vietnamese:

1. Resolution No. 19/NQ-CP by the Government on 18th March 2014 on main tasks and solutions for continued improvement of business environment and enhancement of national competitiveness.
2. Resolution No. 19/NQ-CP by the Government on 12th March 2015 main tasks and solutions for continued improvement of business environment and enhancement of national competitiveness for two years 2015-2016.
3. Resolution No. 19-2016/NQ-CP by the Government on 28th April 2016 main tasks and solutions for continued improvement of business environment and enhancement of national competitiveness for two years 2016 - 2017, visions to 2020.
4. Resolution No. 19-2017/NQ-CP by the Government on 06th February 2017 main tasks and solutions for continued improvement of business environment and enhancement of national competitiveness for 2017, visions to 2020.
5. Resolution No. 19-2018/NQ-CP by the Government on 15th May 2018 main tasks and solutions for continued improvement of business environment and enhancement of national competitiveness for 2018 and following years.
6. Report on Status and results for 3 years of implementation of Resolution No. 19 on improvement of business environment and enhancement of national competitiveness, Ministry of Investment and Planning (2016). Document for the on-line conference of the Government and local administrations, December 2016.
7. Sacha Wunsch-Vincent, 2017. "Index of innovation of Vietnam: exploitation of advantages and over-pass of challenges". The presentation on the Workshop "Guidelines for implementation of Resolution No 19-2017/NQ-CP by the Government on Index of innovation. Hanoi, 22nd Mars 2017.

In English:

8. WIPO, Cornell University, INSEAD. 2016. *The Global Innovation Index 2016. Winning with Global Innovation*. WIPO, Geneva.
9. WIPO, Cornell University, INSEAD. 2017. *The Global Innovation Index 2017. Winning with Global Innovation*. WIPO, Geneva.
10. WIPO, Cornell University, INSEAD. 2018. *The Global Innovation Index 2018. Energizing the World with Innovation*. WIPO, Geneva.
11. WEF. 2018. *Readiness for the Future of Production Report 2018*. WEF. Geneva.
12. Klaus Schwab. 2017. *The Global Competitiveness Report 2017*. WEF. Geneva.
13. Klaus Schwab. 2018. *The Global Competitiveness Report 2018*. WEF. Geneva.