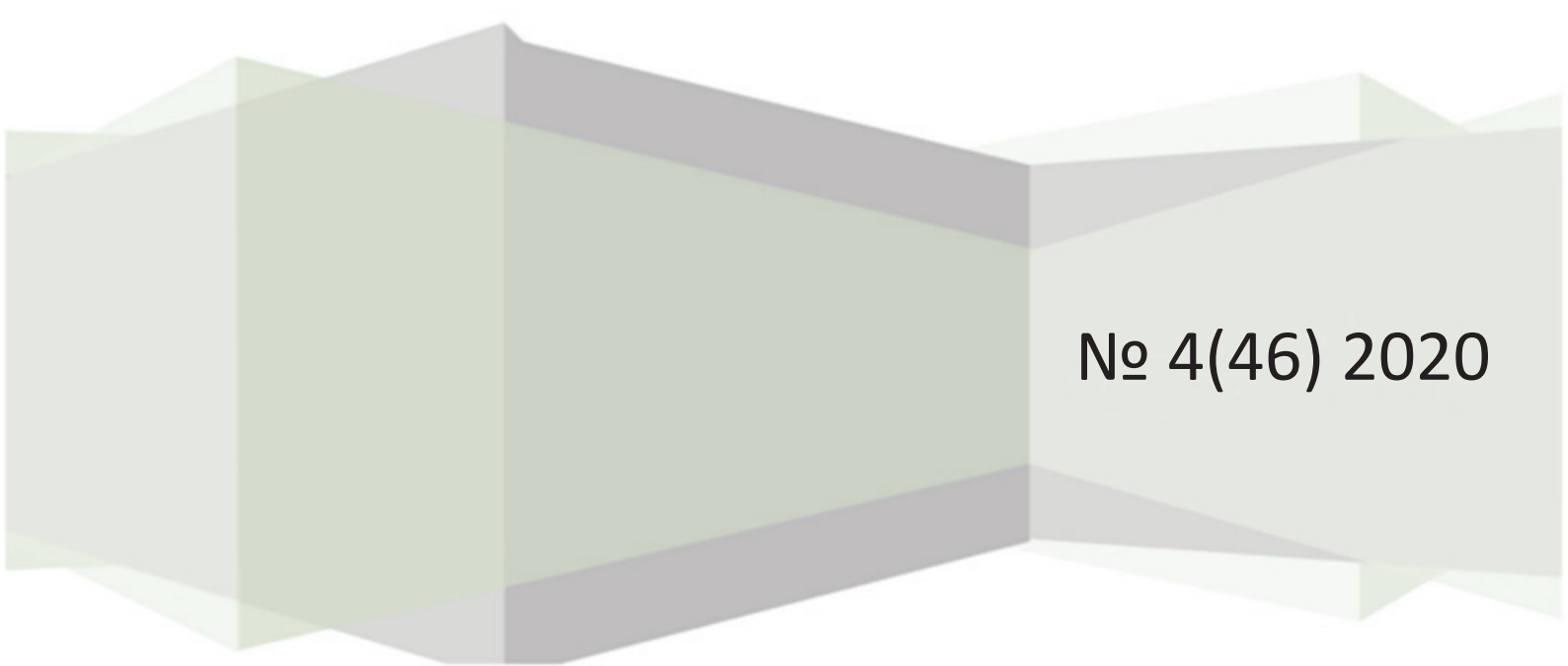


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## Factors Affecting Labour Productivity in Construction Projects of Iraq

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**Key words and phrases:** analysis; labour productivity; factors; construction management; Iraq.

**Abstract.** Productivity is a very important element in the assessment process in construction management. The purpose of this study is to identify and analyze factors affecting labour productivity in construction projects. The objective of the study is to monitor labour productivity during the construction phase of a project in Iraq. The research methodology is as follows: in this study, 20 factors were collected from a survey and interviews with engineers and experts. These factors were grouped into the categories of "Workforce", "Leadership", "Motivation", "Materials/Equipment" and "External factors". Statistical analysis was performed using SPSS packages. A relative importance index was used to identify the most significant factors affecting productivity. Conclusions: The results showed that the main factors affecting labour productivity are: weather changes (89.27 %), religious events (88.81 %), availability of raw materials (88.50 %), number of working groups (87 %), work experience (86.41 %). Thus, the continuous evaluation of work is an important step to improve work efficiency.

Labour productivity plays an important role in the success of any construction project [4; 6]. There are various definitions of productivity; all of them indicate the ratio of output to input resources. However, many factors [2; 3] and variables can affect productivity. Variables include factors related to labour, workforce group, leadership group, motivation group, material/equipment group and external factors.

This study is based on a survey from the site aimed at efficiently collecting all the necessary information. The questionnaire included 2 parts: the first section includes general information about the participant. The second section includes 5 tables, which represent 5 groups of factors affecting work performance. To confirm the summary results of the questionnaire, a second assessment was carried out after review and revision to ensure its effectiveness and suitability for construction projects in Baghdad (Iraq). The original questionnaire consists of 20 factors affecting labour productivity in construction projects in Iraq. Among 62 engineers (N = 62), the sample size is necessary for the successful operation of the entire target sample.

**Table 1.** Workforce group

Labour workforce factors	RII%	Rank	Degree of impact
1. The number of working groups	87	1	(VHE)
2. Worker experience	86.4	2	(VHE)
3. The age of employees	83	3	(VHE)
4. The number of auxiliary workers	77	4	(HE)
5. Lack of competition	62	5	(HE)

**Table 2.** Leadership group

Leadership group factors	RII%	Rank	Degree of effect
1. Lack of skilled workforce	84.9	1	(VHE)
2. Misunderstanding between the workforce and managers	66.13	2	(HE)
3. The lack of periodic meetings with the workforce	57.3	3	(AE)

Data were analyzed using (Importance Index II) according to the following equation:

$$II = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5(n_1 + n_2 + n_3 + n_4 + n_5)} \%,$$

where  $n_1$  – respondents chose very low impact;  $n_2$  – respondents chose low impact;  $n_3$  – respondents chose medium impact;  $n_4$  – respondents chose high impact;  $n_5$  – respondents chose very high impact.

These five expressions are defined as follows:

- $10 \leq$  very small effect (VSE)  $\leq 20$ ;
- $20 \leq$  some effect (SE)  $\leq 40$ ;
- $40 \leq$  average effect (AE)  $\leq 60$ ;
- $60 \leq$  high effect (HE)  $\leq 80$ ;
- $80 \leq$  very high effect (VHE)  $\leq 100$ .

### Workforce group

Table 1 shows that the respondents ranked the “Number of working groups” as the most important factor affecting labour productivity in this group with RII of 87 %.

### Leadership group

Leadership group are classified according to factors as shown in Table 2.

Table 2 shows that the respondents ranked the “Lack of skilled workforce” as the most important factor affecting this group with RII of 84.9 %.

**Table 3.** Motivation factors

Motivation factors	RII %	Rank	Degree of impact
1. Delay of payment	84.8	1	(VHE)
2. System of financial motivation	81.12	2	(VHE)
3. System of moral motivation	68.4	3	(HE)
4. Lack of training	52.8	4	(AE)

**Table 4.** Material equipment factors

Factors of material and equipment	RII %	Rank	Degree of effect
1. Material availability	88.5	1	(VHE)
2. The unsuitability of material storage	76.6	2	(HE)
3. Lack of tools and equipment	73	3	(HE)
4. Inefficiency of equipment	61.8	4	(HE)

**Table 5.** External factors

External factors	RII%	Rank	Degree of effect
1. Weather changes	89.27	1	(VHE)
2. Religious events	88.81	2	(VHE)
3. Safety	76.43	3	(HE)
4. Exposure to neighbouring buildings	74.11	4	(HE)

### Motivation group

Table 3 shows the classification of the relative importance index in the motivational group.

Table 3 shows that respondents rated “Delay of payment” as the most important factor affecting labour productivity in this group an RII of 84.8 %.

### Group of materials/equipment

The relative importance index and ranking of factors assigned to the “Group of materials and equipment” are given in Table 4.

Table 4 illustrates that the survey participants named the factor “material availability” as the most important factor affecting labour productivity in this group with RII of 88.5 %.

### Group of external factors

Table 5 illustrates that the survey participants noted the “weather changes” factor as the

most important factor affecting labour productivity in this group with an RII of 89.27 %.

Twenty specific factors are grouped into five groups.

The results show that the most important groups affecting labour productivity in public construction are the group of External factors, Material/Equipment, Workforce, Leadership and Motivational.

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### Факторы, влияющие на производительность труда в строительных проектах Ирака

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**Ключевые слова и фразы:** анализ; Ирак; производительность труда; управление в строительстве; факторы.

**Аннотация.** Производительность является очень важным элементом в процессе оценки управления строительством. Целью данного исследования является выявление и анализ факторов, влияющих на производительность труда в строительных проектах. Задачей исследования является мониторинг производительности труда на этапе строительства в Ираке. Методика проведенных исследований: в этом исследовании были собраны 20 факторов из опроса и интервью с инженерами и экспертами. Эти факторы сгруппированы в категории «Рабочая сила», «Лидерство», «Мотивация», «Сырье» и «Внешние факторы». Статистический анализ был выполнен с использованием пакетов SPSS. Относительный индекс важности использовался для выявления наиболее значимых факторов, влияющих на производительность. Результаты, показали, что основными факторами, влияющими на производительность труда, являются: изменения погоды (89.27 %), религиозные события



(88.81 %), наличие сырья (88.50 %), количество рабочих групп (87 %), опыт работников (86.41 %).

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## Introduction of National Construction Standards to Increase the Effectiveness of Construction Industry in Burundi

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**Key words and phrases:** regulation in construction; quality; building standards; national association; apartment buildings.

**Abstract.** The paper discusses the importance of introducing national standards in the construction industry to manage construction projects more effectively in terms of time, cost, scope and quality. The managerial and technological decisions regarding the scope and the schedule directly affect the quality of the final construction product. Lack of regulation in the construction industry in Burundi prevents the achievement of the required quality of residential buildings. This article discusses the necessity of creating the national building codes to ensure the quality of multi-apartment residential buildings. A scheme for the organization of construction regulation in Burundi is proposed.

### Introduction

The construction industry is an important sector of the national economy necessary to accelerate economic progress and reduce poverty. The relationship between housing investment and economic development has been established for many regions at different time periods [1; 2]. These studies found that the housing sector can support poverty reduction and positively influence the growth of the country's economy as a whole. Discussion of the construction project is hampered by the fact that there is no common understanding of the rules of the game between the various participants in the building process. These rules are created by the state, which establishes the minimum necessary requirements for buildings and structures. Throughout the life cycle of a construction project, quality is seen as a relative fixed goal, while project participants control time, cost and volume constraints [3; 4]. In order to ensure the quality of buildings and structures, standardization tasks are formulated in such a way as to optimize the requirements for product, process or service standards; and also to achieve the maximum effect at a given cost, that is, to achieve a minimum cost, with a fixed effect [5].

### Ways of creating national building standards in Burundi

The basic law governing construction activities is created by the country's legislative body in

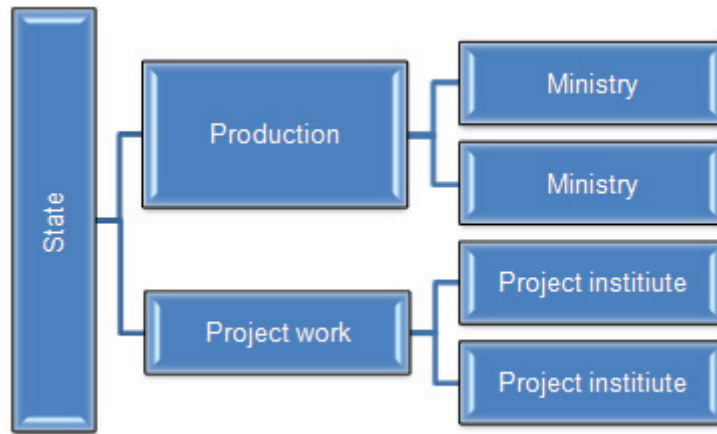


Fig. 1. Design and construction regulation (option 1)

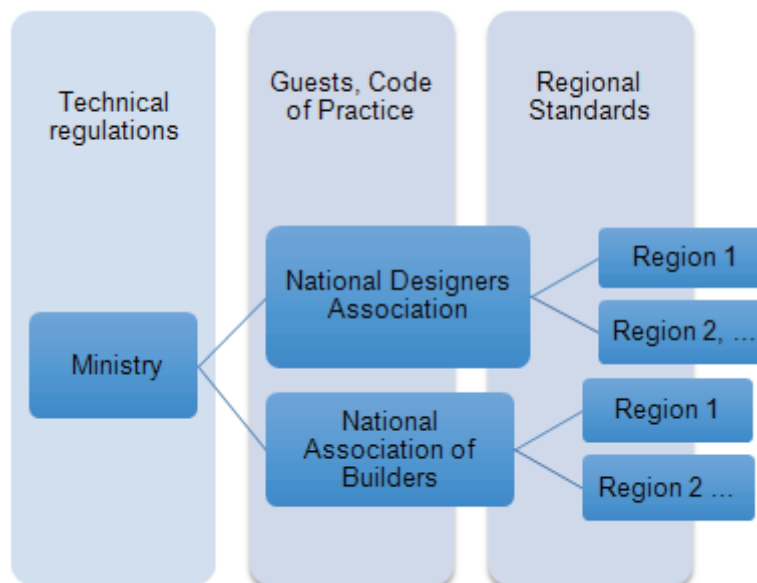


Fig. 2. Design and construction regulation (option 2)

the form of a town-planning code.

The need to create regulation is to improve quality, reduce costs and reduce construction time based on the achievements of science and technology.

There are 2 options for regulating the construction industry in Burundi.

**The first option**

The government formulates all obligations, directly regulates the market and establishes specific requirements for products (Fig. 1). Production activities are controlled through the ministries of production, and design activities through design institutes that design buildings and structures.

Such a model is not suitable for the construction field due to its rapidly developing features. Its use reduces the innovative component of the market.

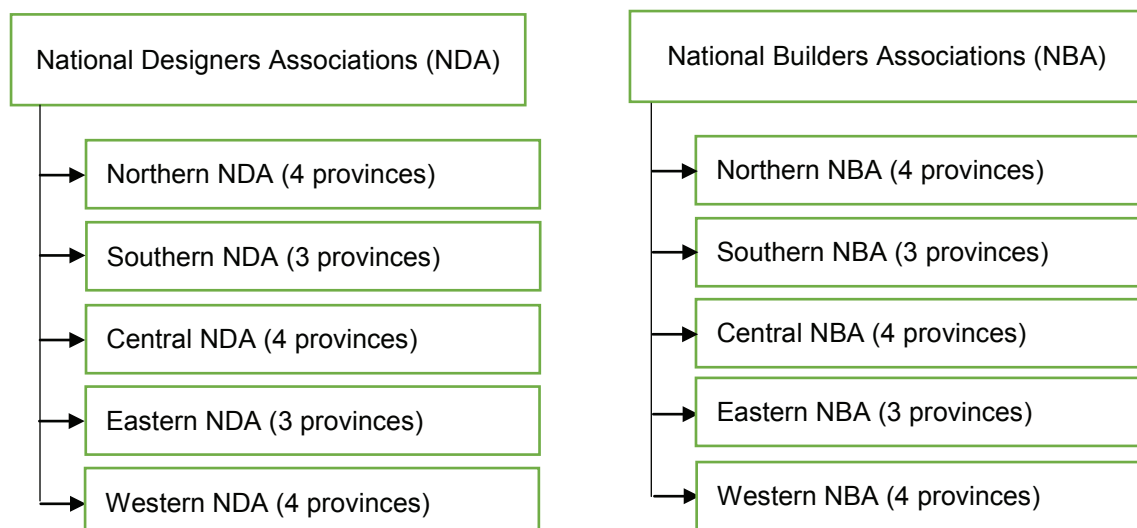


Fig. 3. Regulation by provinces

### The second option

The state divides obligations (Fig. 2). The legislator creates a regulation that sets out general requirements for construction products that ensure the safety of people, property and the environment. The codes of practice aimed at implementing the provisions of this regulation are developed by the authorized bodies of specialists in the field of design and construction. Such bodies of specialists can serve as an association of designers or builders. At the same time, the state reserves the right to approve the developed standards.

According to the second regulation option, it is assumed that the legislator, through the Ministry of Construction, Transport, Infrastructure and Planning of the Territory of Burundi, issues technical regulations. This regulation is binding in the form of a regulatory legal document. The provisions of the regulation indicate that the objects at all stages of creation should:

- protect the life and health of citizens, property of individuals or legal entities, state or municipal property;
- protect the environment, life and health of animals and plants;
- ensure the energy efficiency of buildings and structures.

The necessary sets of rules for the implementation of the provisions of this regulation are developed by national associations of specialists in the field of design and construction.

Then in the field of design should form the National Designers Association (**NDA**). They have the right to issue design permits. All design organizations are included in the NDA. Its structure includes various directions, including for the development of a system of regulatory documents. The developed standards are mandatory for all design organizations that are members of the NDA. Also in the field of construction, a national association of builders is being formed. They have the right to issue permits for construction work. All construction organizations are part of the National Builders Association (**NBA**). Its structure includes various directions, including for the development of a system of regulatory documents. The developed standards are mandatory for all design organizations that are members of the NBA.

Each region of Burundi has its own specifics; regional associations are formed in the field of design and construction (Fig. 3). The country has 17 provinces. They should be grouped into 5 regions according to the principle of similar climatic conditions.

1. The northern region, which includes 4 provinces: Kirundo, Muyinga, Ngozi, Kayanza.
2. The southern region, which includes 3 provinces: Bururi, Rumonge, Makamba.
3. The central region, which includes 4 provinces: Muramvya, Muaro, Gitega, Carusi.
4. The eastern region, which includes 3 provinces: Rutana, Ruyigi, Cankuzo.
5. The western region, which includes 4 provinces: Chibitoke, Bubanza, Bujumbura-Mary, Bujumbura-Rural.

Each province will have its own self-regulatory organizations that work out their standards taking into account their regional characteristics and construction experience.

### Conclusion

Self-regulatory organizations are an effective tool for ensuring quality and safety in construction. The second option for regulating the construction industry is a suitable model, where self-regulatory organizations of specialists in the field of design and construction develop and introduce national standards for approval. This increases the responsibility in the implementation of projects; introducing modern innovative technologies and materials in construction; economic advantages are obtained at the optimum level of quality by choosing a reliable contractor that works according to modern standards.

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**К вопросу о необходимости внедрения национальных стандартов  
в строительной отрасли для повышения эффективности организации  
строительного производства в Бурунди**

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**Ключевые слова и фразы:** качество; многоквартирные дома; национальное объеди-

нение; регулирование в строительстве; строительные стандарты.

**Аннотация.** Обсуждается необходимость внедрения национальных стандартов в строительной отрасли для более эффективного управления строительными проектами с точки зрения времени, стоимости, объема и качества строительства. Управленческие и технологические решения, касающиеся объема и графика, непосредственно влияют на качество конечного строительного продукта. Отсутствие регулирования в строительной отрасли в Бурунди препятствует достижению требуемого качества жилых зданий. Рассматривается необходимость создания национальных строительных норм и правил для обеспечения качества многоквартирных жилых домов. Предложена схема организации строительного регулирования в Бурунди.

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## Modern Understanding of Factors and Structure of the Living Standard

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**Key words and phrases:** complex living conditions of citizens; economic aspects of human life; level of satisfaction of needs; standard of living.

**Abstract.** In order to study the concept and structure of the standard of living, it is necessary to analyze the complex of living conditions of the country's citizens and the level of satisfaction of those needs that actually developed in a certain historical period. Based on the methods of historical, cultural and economic analysis, a close relationship is revealed not only between the economic aspects of human life, but also social, psychological, historical and many others. As a result, it is found that the analysis of the standard of living needs to use a large set of different indicators, since human life consists of many aspects.

The standard of living is a set of living conditions for citizens and the level of satisfaction of their needs, which actually developed in a certain historical period.

Judging by the definition, it is clear how complex and multifaceted this concept is. It touches upon not only economic issues of human life, but also social, psychological, historical aspects and many others. When analyzing the standard of living, a large set of different indicators is used, since human life consists of many aspects, and even more so, of an even greater number of needs, the exact number of which cannot be defined even approximately [1].

When considering the standard of living, many factors must be taken into account. First, these are historical factors. It is illogical to compare modern statistical data with data from a century ago and draw conclusions based only on quantitative change. Life and progress do not stand still; the needs of people are constantly growing and changing, as the number of people living on Earth is increasing. Goods that could have been a luxury until recently may no longer be in demand today, or may even become harmful to humanity.

Second, there are geographical factors to be taken into consideration. The living conditions of people clearly differ significantly across the planet. In accordance with these conditions, the needs will also differ. Thus, in arid areas, people will be more in need of clean water, food, and some simple shelter that protects from the heat, while not storing heat. At the same time, in another part of the planet, where there is a negative temperature for more than eight months a year, people will have slightly different needs. They will also need food and water, but they will need strong homes that are resistant to low temperatures, and a significant portion of their

income will go to heating, warm clothing, and the like.

Third, there are socio-cultural factors. Each culture has its own characteristics. If in one country discrimination against women is natural; the majority of the population does not even have primary education and does not want to receive it; early marriages and large families are accepted, then in another country, which considers itself highly developed, all this will seem wild.

The effect of factors can be strengthened or weakened by natural and climatic conditions and the availability of all possible resources (natural, labor, production, financial, informational, and spiritual). But there is no direct relationship here. For example, Japan and Switzerland are considered to be the most prosperous countries, which have very poor natural resources. The high level of security of residents is observed in countries with a large population (USA, Germany, Japan), and in small countries (Luxembourg, Finland, Switzerland). For example, Canada, Norway, and Russia have severe climatic conditions in the Northern regions, and these countries have radically different living standards [1].

No matter how complex the analysis of living standards is, it is still organized in a clear structure and has its main components. In the structure of the standard of living there are the following components.

1. Human living conditions: the most basic human needs are taken into account, such as consumption (both food and non-food goods and services), decent housing and health.

2. Working conditions: they include the factors and conditions that a person faces in the course of their work. They mean labor protection, the possibility of injuries and the acquisition of occupational diseases, and sanitary and hygienic conditions at each workplace and at the entire enterprise as a whole.

3. Conditions of human development: it is the most complicated component. It includes many aspects that reflect almost all areas of modern human life. Living conditions include the level of income and the structure of its distribution to expenditures; levels of fertility, mortality and life expectancy; development of the social sphere; the existence of human rights and the level of their observance.

4. Environmental safety: it is a relatively new component. It describes the state of the environment and the degree of its interaction with humans.

All these components are very dependent and intertwined with each other, so it is difficult to judge any strict separation of them. However, in practical life, for more accurate monitoring within each component, a number of statistical indicators have been identified, which are appropriate to use [3].

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### **Факторы и структура уровня жизни в современном понимании**

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**Ключевые слова и фразы:** комплекс условий жизни граждан; уровень жизни; уровень удовлетворения потребностей; экономические аспекты человеческой жизни.

**Аннотация.** С целью изучения понятия и структуры уровня жизни необходимо проанализировать комплекс условий жизни граждан страны и уровень удовлетворения тех потребностей, которые фактически сложились в определенный исторический период. На основе методов исторического, культурного и экономического анализа выявлена тесная взаимосвязь не только с экономическими аспектами человеческой жизни, но и с социальными, психологическими, историческими и многими другими. В результате установлено, что при анализе уровня жизни необходимо использовать большую совокупность различных показателей, так как человеческая жизнь состоит из множества аспектов.

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## Analysis of Development Synchronicity of Investment Construction Sector

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**Key words and phrases:** analysis; investment-construction sector; development; synchronicity.

**Abstract.** The paper explores relevant questions of analysis of investment-construction complex development. The research objective is implementation of analysis of development synchronicity of investment-construction complex. The following tasks were formulated for achieving this objective: to propose indicators of development synchronicity; to identify levels of development synchronicity; calculate indicators of development synchronicity of investment-construction complex. The research hypothesis consists in assumption that stages of investment-construction complex life cycle can be identified on the basis of using of phase analysis. During the research process the following methods were used: abstraction method, classification method, method of comparison, analysis, synthesis. As a result of the research indicators of development synchronicity are proposed, their values are calculated.

The analysis of the development of the investment and construction sector (ICS) [1] can be carried out on the basis of identifying the stages of its life cycle. In this regard, the author of this work has previously proposed an appropriate method of analysis [4]. This article is devoted to the development of indicators of synchronicity of development, the definition of which allows a comparative analysis of the ICS development within different territories.

The following four groups of indicators of the life cycle can be identified: indicators of the composition of the phases (the frequency of occurrence of each stage, the weight of each stage), indicators of duration of stages (maximum, minimum duration of each stage), indicators of succession stages (the specific weight of the subsequent stages, the previous stages), indicators of synchrony of development (level of heterogeneity of development, coefficient of synchronism development).

Since the indicators of the first three groups were considered earlier [4], this paper offers a description of the indicators of synchronicity in the ICS development.

Development synchronicity indicators include the development synchronicity coefficient and the development heterogeneity indicator. The value of the development synchronicity coefficient is calculated by formula:

**Table 1.** Frequency of manifestation of stages of the life cycle of the investment and construction complex

Period \ Stage	Frequency of manifestation				
	Beginning	Growth	Prosperity	Slowdown	Decline
2000–2001	0	6	0	0	0
2001–2002	0	2	0	4	0
2002–2003	0	4	2	0	0
2003–2004	0	0	0	6	0
2004–2005	5	0	0	0	1
2005–2006	4	1	0	0	1
2006–2007	0	5	0	1	0
2007–2008	0	1	5	0	0
2008–2009	0	1	0	5	0
2009–2010	3	3	0	0	0
2010–2011	2	3	1	0	0
2011–2012	0	3	1	1	1
2012–2013	0	3	0	3	0
2013–2014	0	1	3	2	0
2014–2015	0	1	0	5	0
2015–2016	5	0	0	1	0
2016–2017	0	0	0	2	4

$$S_i = \frac{f_i}{\sum_{i=1}^5 f_i},$$

where  $S_i$  is the value of the synchronicity coefficient for the  $i$ -th stage of the ICS lifecycle;  $i$  is the stage number within the life cycle of the ICS (takes values from 1 to 5, since five stages are taken into account, 1 corresponds to beginning, 2 corresponds to growth, 3 corresponds to prosperity, 4 corresponds to slowdown, 5 corresponds to decline);  $f_i$  is the frequency of manifestation of the  $i$ -th stage of the life cycle of the ICS.

The development synchronicity coefficient is calculated for each stage of the ICS life cycle, taking into account a certain number of territories and a specific time period. In this regard, to determine the values of the mentioned coefficient on the example of six Federal districts (Central, North-Western, Volga, Ural, Siberian, and far Eastern Federal districts), the frequency of occurrence of each stage of the life cycle of the ICS was estimated within the previously designated time periods (Table 1). The initial data were information about the dynamics of the stages of the life cycle of the ICS, which were developed earlier [4].

**Table 2.** Development synchronicity indicators in the investment and construction sector

Stage Period	Development synchronicity coefficient values					The average value of the development synchronicity coefficient	The development heterogeneity indicators, in points
	Begin- ning	Growth	Prosperity	Slow- down	Decline		
2000–2001	0.00	1.00	0.00	0.00	0.00	1.00	1
2001–2002	0.00	0.33	0.00	0.67	0.00	0.56	2
2002–2003	0.00	0.67	0.33	0.00	0.00	0.56	2
2003–2004	0.00	0.00	0.00	1.00	0.00	1.00	1
2004–2005	0.83	0.00	0.00	0.00	0.17	0.72	2
2005–2006	0.67	0.17	0.00	0.00	0.17	0.50	3
2006–2007	0.00	0.83	0.00	0.17	0.00	0.72	2
2007–2008	0.00	0.17	0.83	0.00	0.00	0.72	2
2008–2009	0.00	0.17	0.00	0.83	0.00	0.72	2
2009–2010	0.50	0.50	0.00	0.00	0.00	0.50	2
2010–2011	0.33	0.50	0.17	0.00	0.00	0.39	3
2011–2012	0.00	0.50	0.17	0.17	0.17	0.33	4
2012–2013	0.00	0.50	0.00	0.50	0.00	0.50	2
2013–2014	0.00	0.17	0.50	0.33	0.00	0.39	3
2014–2015	0.00	0.17	0.00	0.83	0.00	0.72	2
2015–2016	0.83	0.00	0.00	0.17	0.00	0.72	2
2016–2017	0.00	0.00	0.00	0.33	0.67	0.56	2

Then the values of the ICS development synchronicity coefficients were calculated (Table 2). For example, in the period from the end of 2001 to the end of 2002, the value of the synchronicity coefficient for the growth stage was 0.33, while for the slowdown stage it reached 0.67. At the stages of the beginning, prosperity, and decline of the synchronicity coefficient was equal to zero. These values of synchronicity coefficients indicate that in the period from the end of 2001 to the end of 2002 in most Federal districts there was a slowdown stage in the ICS life cycle. During this period, this stage was recorded in the Volga, Ural, Siberian and far Eastern Federal districts. During the same period, the growth stage was observed only in the Central Federal district and the North-Western Federal district

Taking into account the values of the development synchronicity coefficient for the prevailing stages of the ICS life cycle, it should be noted that in the periods from the end of 2000 to the end of 2009, these values did not fall below 0.67. Over the next five years (from the end of 2009 to the end of 2014), the values of the development synchronicity coefficient for the prevailing stages of the life cycle were at the level of 0.5. In the period from the end of 2014 to the end of 2017, the mentioned values did not fall below 0.67 again.

The average value of the development synchronicity coefficient for all the considered stages of the ICS life cycle were calculated using the formula:

$$\bar{S} = \frac{\sum_{i=1}^5 S_i f_i}{\sum_{i=1}^5 f_i},$$

where  $\bar{S}$  is the average value of the synchronicity coefficient;  $S_i$  is the value of the synchronicity coefficient for the  $i$ -th stage of the ICS lifecycle;  $i$  is the number of the stages in the ICS life cycle;  $f_i$  is the frequency of manifestation of the  $i$ -th stage of the ICS life cycle.

We propose to distinguish the following levels of synchronicity of development, taking into account the average value of the mentioned coefficient:

- the high level of development synchronicity at  $0.7 < \leq 1$ ;
- the average level of development synchronicity at  $0.4 < \leq 0.7$ ;
- the low level of development synchronicity at  $0 < \leq 0.4$ .

Thus, for example, the period from end 2000 to end of 2001 was characterized by a high level of the ICS development synchronicity, since the average value of the identified coefficient is equal to one (Table 2). Indeed, in this period in the ICS life cycles in all the Federal districts the growth stage was observed.

In the period from the end of 2001 to the end of 2002, there was an average level of the ICS development synchronicity, since the average value of the coefficient in question was 0.56. During this period, the stage of slowdown was observed in the Volga, Ural, Siberian and far Eastern Federal districts [4].

Taking into account the data in Table 2, we note that the high values of synchronicity coefficients for the stage of slowdown and the average values of this coefficient, indicating a high level of development synchronicity coincided with the period of unfavorable situation in the banking sector in 2004 [2], as well as with the periods of crises in 2008–2009, 2014–2015 [3]. In the period from the end of 2003 to the end of 2004, the ICS in all the above mentioned Federal districts were at the stage of weakening, so the average value of the development synchronicity coefficient was 1.00. In the period from end 2008 to end 2009 and end 2014 to end of 2015, the mentioned value was 0.72, which indicates a high level of the ICS development synchronicity in various Federal districts.

In addition, taking into account the average values of the development synchronicity coefficient for all time periods listed in Table 2, it can be concluded that in 47 % of cases, the development of ICS was characterized by a high level of synchronicity, in 35 % of cases – by an average level of synchronicity, in 18 % of cases – by a low level of synchronicity.

As for the development heterogeneity indicator, it can be defined as an indicator that characterizes the degree of diversity of the observed stages of the life cycle of an individual. This indicator takes values from 1 point to 5 points. The minimum level of development heterogeneity corresponds to 1 point, the maximum level-5 points. If only one stage of the life cycle appears in the study period, the value of the heterogeneity level is 1 point. If two different stages are observed, the value of this indicator is equal to 2 points, and so on.

The analysis of the development heterogeneity level makes it possible to understand the differences between periods in which the same values of the synchronicity coefficient are observed for the dominant stage of the ICS life cycle. For example, we compare between three periods: from the end of 2009 to end of 2010, from late 2010 to late 2011 and from late 2011 to late 2012.

During all these periods, the synchronicity coefficient value for the dominant stage was 0.5. In the first case, the beginning and growth stages prevailed. In the second and third cases, the growth stage dominated. However, in the first case, it is 0.5, which corresponds to the average level of development synchronicity. In the second and third cases, there was a low level of the development synchronicity, since it takes the values of 0.39 and 0.33, respectively. The reason for this situation is a change in the development heterogeneity level. In the period from the end of 2009 to the end of 2010 the value of this parameter was 2 points, in the period from late 2010 to late 2011 it was 3 points, in the period from late 2011 to late 2012 it reached 4 points.

Thus, as a result of the study, the development synchronicity indicators were proposed, and development synchronicity indicators were revealed. In addition, the values of the development synchronicity indicators in the ICS were found using the example of six Federal districts. These indicators can be used to analyze the ICS development.

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### Анализ синхронности развития инвестиционно-строительного комплекса

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**Ключевые слова и фразы:** анализ; инвестиционно-строительный комплекс; развитие; синхронность.

**Аннотация.** Рассматриваются актуальные вопросы анализа развития инвестиционно-строительного комплекса (**ИСК**). Цель исследования заключается в проведении анализа синхронности развития ИСК. Для достижения цели исследования были поставлены следующие задачи: предложить показатели синхронности развития; выявить уровни синхронности развития; определить значения показателей синхронности развития ИСК. Гипотеза исследования заключается в предположении о том, что стадии жизненного цикла ИСК могут быть выявлены с помощью проведения фазового анализа. В процессе исследова-

ния были использованы следующие методы: метод абстрагирования, метод классификации, метод сравнения, метод анализа, метод синтеза. В результате исследования были предложены показатели синхронности развития, а также определены значения этих показателей.

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## Dynamics of Russia's Main Economic Indicators at the Time of the Pandemic

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**Key words and phrases:** countries of the world; gross domestic product; International Monetary Fund; purchasing power parity; Russian economy; structure of the economy.

**Abstract.** In order to analyze the impact of the coronavirus pandemic on the Russian economy and all its life support systems, the paper presents the data reflecting the main indicators of the economy. The economic crisis has exacerbated all the main problems and accelerated their long-term dynamics. The problems identified in the work and ways to solve them will allow us to find measures to mitigate the development of the economic situation in the country in the coming years.

The coronavirus infection pandemic has become a serious test not only for Russian health care, but also for the economy and all life support systems. It affected all the main indicators, accelerating their long-term dynamics. Since the main macroeconomic indicator of Russia's GDP is calculated both in rubles and in foreign currency, the purchasing power parity or PPP system is usually used for correct analysis.

In the past few years, according to the International monetary Fund, Russia has been firmly ranked sixth among the world's countries in terms of gross domestic product, calculated by purchasing power parity.

Rosstat's analysis of Russia's GDP in recent years confirms this (Fig. 1).

**Table 1.** Ranking of the largest countries in the international market

#	Country	2017, bln USD	2018, bln USD	Worldshare, %
1	China	23157	25279	18,67
2	USA	19519	20580	15,2
3	India	9583	10485	7,74
4	Japan	5420	5597	4,13
5	Germany	4176	4343	3,21
6	Russia	4036	4227	3,12



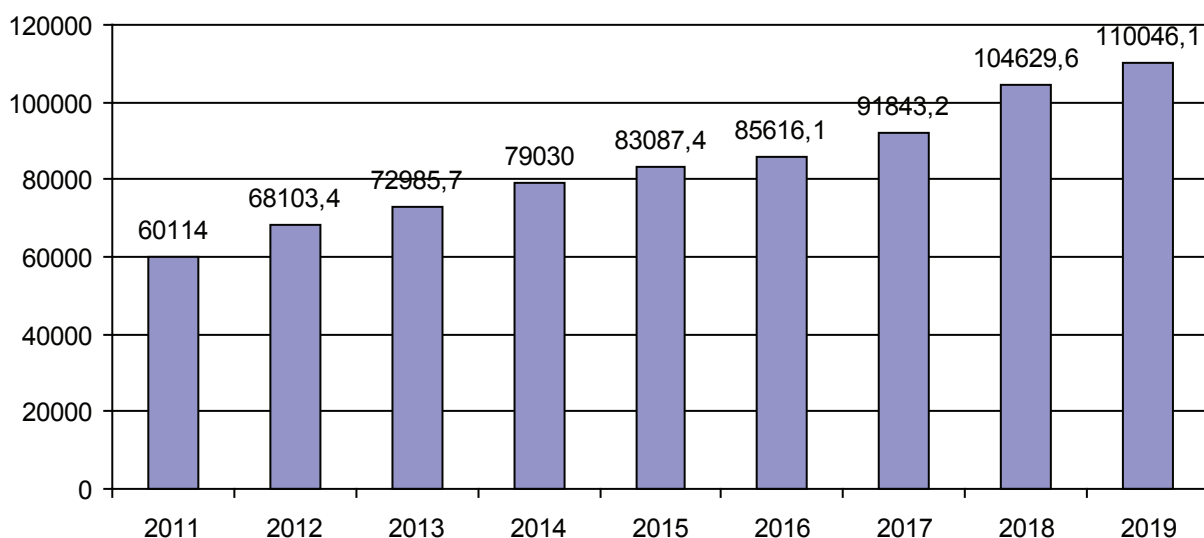


Fig. 1. Dynamics of Russian GDP in current prices

Table 2. GDP structure by sources of income, % GDP

	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Gross domestic product</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
including:									
Remuneration of employees (including remuneration and mixed income not counted by direct statistical methods)	43.9	44.3	46.3	47.4	47.8	48.2	47.8	46.0	46.7
Net taxes on products and imports	14.5	14.4	13.8	13.9	11.1	11.0	10.9	11.4	11.4
Gross profit of the economy and gross mixed income	41.6	41.3	39.9	38.7	41.1	40.8	41.3	42.6	41.9

Table 2 shows the structure of GDP distribution by income sources.

It should be noted that the pace of development of the Russian economy in 2019 has slightly decreased compared to 2018. The structure of Russia's GDP in 2019 has undergone the following changes:

- net exports decreased by 11.1 % due to a decrease in real exports and an increase in imports %;
- consumer spending by citizens increased by 2.3 % compared to 3.3 % in 2018;
- gross fixed capital growth was 1.4 %, compared to 0.1 % in 2018.

The value of Russian exports calculated in constant prices in 2019 decreased by 2.1 % compared to the previous year. This reduction was observed for the first time since 2009. Then in 2009, the negative growth of exports was 4.7 %. Export dynamics in the period 2010–2018 in real terms, it showed constant growth, reaching 5–5.5 % in 2017 and 2018, respectively.

According to Rosstat, the structure of Russia's GDP in 2019 was complicated by the unfavorable external export environment, because the value of net exports of goods and services in GDP decreased from 10 % in 2018 to 7.7 % in 2019. Analysts of the Bank of Russia

indicate that in 2019, exports of goods and services from Russia decreased by 5.7 %, to \$418 billion. This came after two years of export share growth of more than 25 % annually in 2017 and 2018. This was partly due to a decline in global export prices for basic Russian exports in 2019, as well as a reduction in exports of ferrous metals and wheat.

The Federal customs service notes that for the period January-November 2019, the value of Russian oil exports in monetary terms decreased by 5.8 %, gas – by 15.4 %, and petroleum products – by 15.9 %; the export of ferrous metals decreased by 20 % and that of wheat decreased by 23.2 %.

In the same period, according to Rosstat, imports at constant prices in 2019 increased by 2.2 %. A significant increase in imports occurred in the automotive industry, as the growth of imported passenger cars was 9.6 % for the 11 months of 2019, which affected the car trade, which increased by 5.2 %. In the same period, the output of domestic cars fell by 1.7 %. The Federal Customs Service also notes that for the period January-November 2019, the value of imports of medicines increased by 30 %.

The lack of investment and labor resources are significant constraints on the development of the Russian economy. For the Russian economy, in contrast to a number of European countries, an important characteristic is not an excess of labor resources, but a lack of them. The slowdown in the birth rate, combined with the growing aging of the population, is a serious demographic problem in Russia.

Before the onset of the impact of the coronavirus pandemic in September 2019, forecasts were made for GDP growth in the Russian Federation in 2020 by 2 % against 1.7 % in the basic forecast according to the draft Federal budget for 2020 and the planning period 2021–2022. At that time, the basic and target forecast for economic growth in 2021 and 2022 was 3.1 % and 3.2 %, respectively.

But the impact of the pandemic, the self-isolation policy, restriction of work of the enterprises, which began at the end of March 2020, has led to a significant decline in production and consumption, while maintaining current restrictions for another two to three months can give lower output of goods and services 4–6 % per annum. The introduction of new measures of state support for small and medium-sized businesses, as well as the population, in Russia will slightly improve the situation and will amount to about 0.5 % of GDP, while in the EU countries, business support measures are planned in the amount of 10 to 20 % of GDP.

The problem of the Russian economy is not only in the self-isolation policy and reduction in production of the majority of enterprises, the main reason for the impending recession is the long-term stagnation of the Russian economy, which has formed a raw material monostructure of production, preserved the poverty and indebtedness of the population.

The Russian Center for Macroeconomic Analysis and Short-Term Forecasting of the Central Bank of Russia based on data on energy consumption as of March 30 noted a drop in average daily economic activity in Russia by 11–15 %, including in the Central district – by 14–18 %. A sharp decline in economic activity in Russia continues to be recorded against the background of the introduction of a self-isolation regime and the suspension of a number of enterprises.

In the report “13 theses on the economy” from March 30, the CAPC called what is happening in the Russian economy a crisis. Economic stagnation, which lasted for many years, the deterioration of the structure of production and the decline in potential growth caused by the current policy of financial stabilization in terms of external sanctions, the growth of the tax burden and austerity, expensive credit and the high requirements for borrowers. All these measures led to the fact that in 2019, businesses and citizens did not have a reserve of “financial strength”.

Almost all the growth of industrial production was provided by three industries:

- mining;
- production of other types of raw materials, materials and components, and primarily fertilizers;
- food industry.

These problems worsened at the end of 2019, when Russia's exports began to decline amid the US-China trade war and global Capex stagnation.

The current economic crisis will inevitably lead to an increase in the importance of industries that meet priority needs – agriculture, food production, and basic infrastructure products.

Head of the Accounting Chamber, Alexey Kudrin said on 01.04.2020 at a meeting of the President and the government that with a pessimistic development of events in Russia, the situation in 2009 may repeat, when GDP fell by 8 %. But Kudrin also allowed for a moderate scenario in which GDP will fall by 3–5 %, for which the authorities will have to take “non-standard measures to support the economy, including direct subsidies to certain industries”.

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### Динамика основных экономических показателей России в период пандемии

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**Ключевые слова и фразы:** валовой внутренний продукт; Международный валютный фонд; паритет покупательной способности; страны мира; структура экономики; экономика России.

**Аннотация.** С целью анализа влияния пандемии коронавирусной инфекции на эко-

номику России и все ее системы жизнеобеспечения в работе представлены данные, отражающие основные характеристики экономики. Экономический кризис обострил все основные проблемы, ускорив их многолетнюю динамику. Выявленные в работе проблемы и пути их решения позволят найти меры по смягчению развития экономической ситуации в стране в ближайшие годы.

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