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OPEN SOURCE: THE CASE OF CHANNELS

The Open Source paradigm is taking over the world: 37% of all companies use Open Source software; large companies are almost twice as likely to use open source software as small counterparts (63% vs. 37%); the number of Forbes Global 2000 companies using open source solutions tripled; 79% of the world's software vendors use open source code to build commercial systems [1].

Open Source is a form of the free software movement, which was founded by Richard Stallman. It was he who in 1983 started the GNU project to create a Unix-like operating system that would have only open source software. In 1984, Stallman left MIT to devote himself fully to the GNU project. In the early 1990s, almost all the necessary components of the system were developed, with the exception of the core. Linus Torvalds, a Finnish student of Helsinki University created it as a hobby. The kernel's name "Linux" was invented by Ari Lemmke, the server administrator of the university network.

Richard Stallman considered and called his software free (free software, software libre) in contrast to proprietary software, which is protected by property and/or non-property copyright. Proprietary software has closed access to the code, does not allow changes, duplication, distribution and resale.

The fact that a program is provided for free does not mean that it is free: there are free software products whose source code is not published or there are restrictions on their use or distribution. And, conversely, open software does not necessarily have to be free: copies can be distributed for money, but the user cannot be restricted in any of the specified rights.

The most famous example of a proprietary computer operating system is Microsoft Windows. Open source operating system – Linux. An open source Linux system developed by enthusiasts for use on their own computers, thanks to the support of IBM and others. Large companies, gained popularity as a server operating system. It is installed on many hardware platforms, smartphones, tablet PCs, routers, automation devices and other gadgets.

Stallman himself does not accept the alternative name "Open Source", at least in relation to programs under the GNU Lesser GPL licenses, because, in his opinion, this term hides the true purpose of such software, which is freedom. Despite this, the concept of Open Source is catching on even outside the software field.

If you look into history, the activities of Eliezer Ben-Yehuda, a man who spent his whole life engaged in the revival of Hebrew as a modern spoken language, can well claim the place of the forerunner of Open Source. The beer "Voresøl" is worth to be mentioned in this regard also (translation means "Our beer") [2]. The drink was created by Danish students as a challenge to Carlsberg's closed-code beer. To begin with, the students met with the author of a Danish book on home brewing. Then they agreed on the type of beer they wanted, bought the ingredients and brewed about 100 liters of beer right in the university canteen. Thus, according to software traditions, version 1.0 of "Our

beer" appeared. The recipe, as for any software product with open source code, was published with the statute of "license of national creativity", after which people from Mexico, Brazil and even Afghanistan joined the experiments in making the Open Source product.

But an Open Source product, if it is interpreted as any development open to study, modify, replication, distribution and resale, according to the authors of this work, can refer to much larger phenomena that are far from the field of software. The purpose of the work is to demonstrate the moment of open source code as a case studies, in particular, of the maritime transport channels.

Research methods: theoretical–analysis, abstraction, synthesis, case studies.

Case study 1. Modification and replication of Hohenwarte Dams' design (on the Elbe) during the reconstruction of the Panama Canal.

In 2006, the decision of the Panama Canal administration to increase the capacity of the transport artery of world importance due to the construction of the third line of locks (significantly increasing overall dimensions – 420 m long, 60 m wide and 18 m deep, with the length of each lock up to 2.4 km) was adopted in 2006. It was a technological, but more of an environmental challenge. Regularly filling the locks with water required 8 million tons of fresh water per day. The expansion of the canal with the construction of new locks made it necessary to double the consumption of water resources. This required new reservoirs with new dams, resettlement of residents of entire districts, which is impossible without great political tension. Even in a tropical country where up to 2,500 mm of rain fall annually, saving fresh water becomes the most important task for engineers.

The delegation from the Panama Canal Authority discovered the solution to the problem as a result of studying the design of the Hohenwarthe Dams on the Elbe River in Germany: the water that passed through the lock during lifting and lowering operations is partially returned for reuse, and not, as usual, dumped into the ocean [3].

The borrowed technical-technological solution turned out to be very important against the background of the current drought, from which the Panama Canal is currently suffering. Passing through the old lock system requires about 500 million liters of water per vessel, while the new route requires 200 million liters. As a result, the daily throughput capacity of one set of locks for Panamax class vessels has decreased from 23 to 16, and for many of the larger Neopanamax vessels serving the locks in 2016, has remained at 10 vessels per day [4].

Case study 2. Modification and replication of Berendrecht (Antwerp) lock door design during the reconstruction of the Panama Canal.

A solution to the maintenance problem for the 730 t double-leaf flood gates has been found in Europe, where locks were already capable of passing the vessels of Post Panamax size. The Belgian Berendrecht Lock in Antwerp became an analogue. The gate has wheels and can roll out and block the airlock chamber. Particularly attractive in such a design is the possibility of turning any of the niches into a miniature dry dock, which allows you to carry out all the necessary preventive and repair work with the mechanisms of lock gates without stopping the movement of ships along the canal.

Case study 3. Adaptation and replication of the procedure for the passage of vessels with a large sediment through the Suez Canal in Ukraine.

Unlike the Panama Canal, the Suez Canal has no locks, so the only limiting parameter is sediment. Ships capable of passing through the Suez Canal with a full load of 150,000 tons are called Suezmax. The passage of ships with a larger tonnage makes it necessary to unload a part of the cargo when entering the canal and load it on board after leaving the canal [5].

The scheme developed for the Suez Canal was implemented in a certain way for the handling of Capesize vessels in the Black Sea ports of Illichivsk and South. The name Capesize was given to ships that are not able to pass through the Suez and Panama Canals due to their dimensions and therefore have to go around Cape Horn in South America or the Cape of Good Hope in South Africa. Transformations of the global economy contribute to the increase in the size of the Capesize class fleet.

This is what exacerbated the problem of port servicing of heavy cargo ships in the ports of Ukraine, which are relatively shallow, and sparked interest in the experience of shipping supertankers through the Suez Canal.

Modernization of the specified scheme found two types of implementation in Ukrainian practice. First, it is incomplete loading of ships near the quay wall with additional loading of materials on the outer road. The first application of such experience took place in 2016 in the Illichiv port (now the commercial port of Chornomorsk) during the maintenance of the Capesize Greek bulker "Anangel Astronomer". 176.5 tons of iron ore raw materials were to be loaded. At the first stage, directly in the water area of the port, more than 121,000 tons were loaded, the rest (55,000 tons) was loaded at the external roadway at a depth of 20 m [6].

Experts consider the processing of a Capesize vessel completely at the berth of a Ukrainian port, without operations on an external roadway, a new method of domestic logistics. The first experience of using the scheme, which was developed on the basis of foreign experience by the company "Metinvest", was the loading operation in 2016 of the bulk carrier "Frontier Youth" with the acceptance on board of the initial part of the ship's batch (110.5 thousand tons of iron ore concentrate of the company "Metinvest") in the port of Chornomorsk with further loading of the second part (64.2 thousand tons) in the port of Pivdenny. The commercial port of Chornomorsk and the port of

Pivdenny are part of the port economy of the so-called Great Odesa. The total volume of cargo on the vessel "Frontier Youth" amounted to 174.7 thousand tons of ore concentrate [7].

Case study 4. Möbius forms.

Scientists from Manhattan David Stark and Elizabeth Anne Watkins (Columbia University, USA) proposed a way of doing business, according to which the subject does not create (bade) assets, does not acquire (buy) them, does not use them cooperatively (cooperate), – it co-opts them (co-opt), that is, to make use of for one's own purposes [8]. Thus, the Amazon company, which at the stage of the Internet trade development did not have its own stores, used the stores of the retail giant Best Buy as its storefront. The retailer was losing revenue because any owner of the app installed on their mobile phone could buy an item they liked from a Best Buy retail store on Amazon at a significant discount.

In the context of Möbius forms, the expression of E. Lorenz (Edward Lorenz) regarding the flapping of a butterfly's wings in Panama (in the original Brazil), which is capable of causing a tornado in Texas [9], becomes appropriate. The case of the modernization of the Panama Canal actualized the idea of "Post Panamax" – container ships with a capacity of up to 12,000 TEU instead of the existing "Panamax" with a capacity of 4,000 TEU (twenty-foot equivalent unit). But the arrival of one such container ship can paralyze the workings of the entire port economy. To avoid this, a major reconstruction was needed, in particular, the Bayonne Bridge, which since 1931 has been among the five largest structures of its kind in the world. The Bayonne Bridge connects Staten Island, New York, and Bayonne, New Jersey, and under its spans the Kill van Kull Channel, ships pass to the two (New York and New Jersey) busiest ports on the east coast. It took a major project launched in 2013 to raise the road surface 215 feet (over 65 m) above the water.

The Panama Canal reconstruction project cost $5.25 billion [10], Americans spent 1.3 billion dollars at work on raising the Bayonne Bridge roadway and modernizing the New York harbor.

Hands-on maintenance of vessels of the new series is available at one or two ports in Northern Europe, two or three ports in Asia and one port in North America [11].

The decision to modernize the canal, which was supported by 79% of Panamanians who came to the referendum, was the most satisfied with the Chinese business structures, both managing the canal and those that accelerated the supply of Venezuelan oil to China for themselves. The task of paying for the consequences of the "historic" transformations is left to Staten Island-bound drivers, who each pass on the bridge costs them from $12.50 to $15.00 [12].

Actors-builders of economies of Möbius forms [13], seek to co-opt the activity of open-sourcers. However, the importance of the Open Source phenomenon is growing more and more in the context of ecology and sustainable development. The international community should promote the transformation of proprietary forms into Open Source forms of nature, with their openness, economic attractiveness, and wide availability. Open Source approaches are more suited to the Industry 5.0 paradigm.

Conclusions

Open Source is gaining more and more popularity in the software industry. Open source computer programs, the same as Linux, place on a large number of hardware platforms, embedded in smartphones, tablet PCs, routers, automation devices and other gadgets. But the authors of this work, using the case of sea channels, prove that the phenomenon of Open Source is much more powerful and wider in terms of implementation than the software world.

The following cases studies are presented: 1) modification and replication of Hohenwarte Dams' design (on the Elbe) during the reconstruction of the Panama Canal; 2) modification and replication of Berendrecht (Antwerp) lock door design during the reconstruction of the Panama Canal; 3) adaptation and replication of the procedure for the passage of vessels with a large sediment through the Suez Canal in Ukraine.

The content of the given cases demonstrates compliance with Open Source principles. In conversation, canal officials make it clear that they see themselves as carrying on a grand engineering tradition. Speaking of the original builders, Alberto Alemán Zubieta, CEO of the ACP, says, "If you look at this canal through the eyes of an engineer, it is still so impressive what they did, how imaginative they were." He and other officials stress that, in contrast to the original construction, the challenges facing the expansion mostly involve well-known technologies [3].

The case of the reconstruction of the Panama Canal in the light of the Möbius forms, i.e. management methods based on the principles of asset co-optation, is considered separately. It was concluded that actors-builders of economies of Möbius forms are able to co-opt the activity of open-sourcers. However, the importance of the Open Source phenomenon is growing more and more in the context of ecology and sustainable development. The international community should promote the transformation of proprietary forms into Open Source forms of nature, with their openness, economic attractiveness, and wide availability. Open Source approaches are more suited to the Industry 5.0 paradigm.

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Череватський Д. Ю., Липницький Д. В., Мишанов А. Ю. Open Source: казус судноплавних каналів

У світовій практиці феномен Open Source зазвичай асоціюється з програмним забезпеченням. Але насправді поняття відкритого коду набагато ширше. Є навіть приклади пива з відкритим кодом. Дослідження присвячено прикладу морських каналів (Панама, Суець) у контексті демонстрації особливостей, характерних для феномена Open Source. На тлі вимог щодо забезпечення сталого розвитку підхід Open Source може стати вирішальним у плані промислового розвитку, реструктуризації інфраструктури та зменшення впливу на навколишнє середовище в цілому. Робота має характер теоретичного дослідження, зокрема з використанням методів абстрагування, аналізу, синтезу, кейсів.

Ключові слова: Open Source, відкритий код, морські канали, промисловий розвиток, реструктуризація інфраструктури.

Cherevatskyi D., Lypnytskyi D., Myshanov A. Open Source: the Case of Channels

In global practice, the Open Source phenomenon is usually associated with software. But in reality, the concept of open source code is much broader. There are even examples of open source beer, etc. The study is devoted to the case study of the sea canals (Panama, Suez) in the context of demonstrating the features characteristic of the Open Source phenomenon. Against the background of the requirements for ensuring sustainable development, the Open Source approach can become decisive in terms of industrial development, infrastructure restructuring, and reduction of the environmental footprint in general. The work was carried out by the method of theoretical research, in particular, using the methods of abstraction, analysis, synthesis, case study.

Keywords: Open Source, open code, sea channels, industrial development, infrastructure restructuring.

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