

## ADVANTAGES AND CHALLENGES OF THE GEODETIC ELECTRONIC CABINET IN THE LVIV TERRITORIAL COMMUNITY

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**Abstract:** *This article analyzes the main advantages and drawbacks of the geodetic electronic cabinet, a new online service for submitting topographic and geodetic works in the Lviv Territorial Community (TC). It demonstrates its role in both digital transformation and the establishment of a local geoinformation database. Through research, its efficiency, informativeness, and convenience at every stage of work, from issuing initial data to signing, have been revealed. The article examines the process of submitting topographic-geodetic works before the cabinet's creation to better understand its advantages. Additionally, it identifies problems with accessing the geodetic electronic cabinet, citing examples of technical glitches on the website due to its relative novelty, which occasionally halted the entire surveying process. The article also illustrates how the creation of the Lviv TC complicated the process of submitting and signing topographic-geodetic works through the electronic cabinet. It highlights the complete lack of a digital topographic base suitable for processing and submitting surveys in all settlements of the community except Lviv city. The study identifies and outlines solutions to two critical problems significantly slowing down the work submission process in the Lviv territorial community: issues with red lines and engineering networks. It predicts that in the future, more territorial communities will utilize the geodetic electronic cabinet to submit topographic-geodetic works to local government bodies.*

**Keywords:** *geodetic electronic cabinet, digital transformation, topographic-geodetic works, Lviv TC, engineering networks, red lines, topographic base, geoservice sector, and engineering networks.*

**Problem statement.** For a long time in our country, there was no online service to automate the process of receiving and submitting geodetic surveys, thereby enabling direct, substantive, and clear communication for the relevant department of architecture and land management organizations. Although the adoption of progressive methods and technologies is one of the main requirements for carrying out topographic-geodetic and cartographic activities in our country [1]. Such a service did not exist until March 2020 when the first geodetic electronic cabinet in Ukraine was launched on the city cadastre website of Lviv based on the geoinformation portal [2]. The creation of the geodetic cabinet was a logical culmination of many changes that had been taking place over the years in the process of accepting and signing geodetic works and surveys within Lviv city. Its appearance is likely to accelerate many processes, increase the productivity of all work, and allow for the protection and storage of all data in one secure place. Through it, the architecture department will be able to effectively populate the local geoinformation database with land plot plans, topographic and executive surveys at a scale of 1:500, which will positively impact the national infrastructure of geoinformation data [3].

If the geodetic electronic cabinet proves its indispensability and effectiveness during operation, then the question of its future use will arise not only by one but possibly by all territorial communities.

Another important aspect of the research is identifying the problems and imperfections of both the geodetic cabinet itself and the overall process of submitting topographic-geodetic works. Identifying shortcomings will help indicate ways to improve not only the entire process of survey acceptance but many of its stages.

**Analysis of recent research and publications.** Many researchers have been engaged in studying digital transformation and its implementation in geodesy and land

management, including V. Artemov, T. Movchan, E. Bakhchevan, T. Danko [4], Putsenteilo P.R., Kostetskyi Ya.I., Bryk M.M. [5].

In their scientific article [4], V. Artemov, T. Movchan, E. Bakhchevan, and T. Danko established a relationship between the training of professionals and the level and pace of digital transformation development. They highlighted the main problems and principles hindering its development. The researchers analyzed the main GIS technologies used in land management over the past twenty years. They concluded that the modern field of geodesy and land management needs a much greater orientation towards new technologies and constant exploration of ways to use them to solve scientific problems. The researchers also pointed out the prospect of applying artificial intelligence in the future in the processes of digital transformation and its implementation in the field of geodesy and land management. Putsenteilo P.R., Kostetskyi Ya.I., Bryk M.M. in their article [5] paid significant attention to the global experience of digitizing land resource management, especially agricultural land.

Researchers such as Bakay Yu.Yu. [6], Karpinsky Yu.O., Lazorenko-Hevel N.Yu. [7], and others were involved in studying the national infrastructure of geospatial data in Ukraine. In his scientific article [6], Bakay Yu.Yu. proposed to refer to the experience of other countries and learn from their mistakes, which are inevitably accompanied by the creation of such complex structure as the national geospatial database. He also concluded that a single system of technical regulations must be introduced, which should comply with national and international geoinformatics standards in order for the national geospatial data infrastructure to be integral rather than fragmented into elements that are very difficult to combine into one system, sometimes even impossible. Karpinsky Yu.O. and Lazorenko-Hevel N.Yu. in their article [7] investigated two approaches to creating digital topographic maps and plans: cartographic and geoinformation. The researchers concluded that the cartographic approach is already outdated and does not help meet the modern needs of the economy and society.

Contemporary urban planning issues were addressed by scholars such as Emelyanova O.M., Titok V.V., Lavrukhina K.O. [8], Khar M.I. [9]. In their article [8],

scholars Emelyanova O.M., Tytok V.V., and Lavrukhina K.O. clearly analyzed the main problems that arise in the development of urban planning. In their opinion, the low level of digitization of urban planning documentation and its generally low level of relevance at all levels - from national to local - are among the main reasons hindering urban planning reform in Ukraine. Khar M.I. in his article [9] points out that inconsistency in the legislative framework with many subordinate acts is another important obstacle that hinders the development of urban planning in our country.

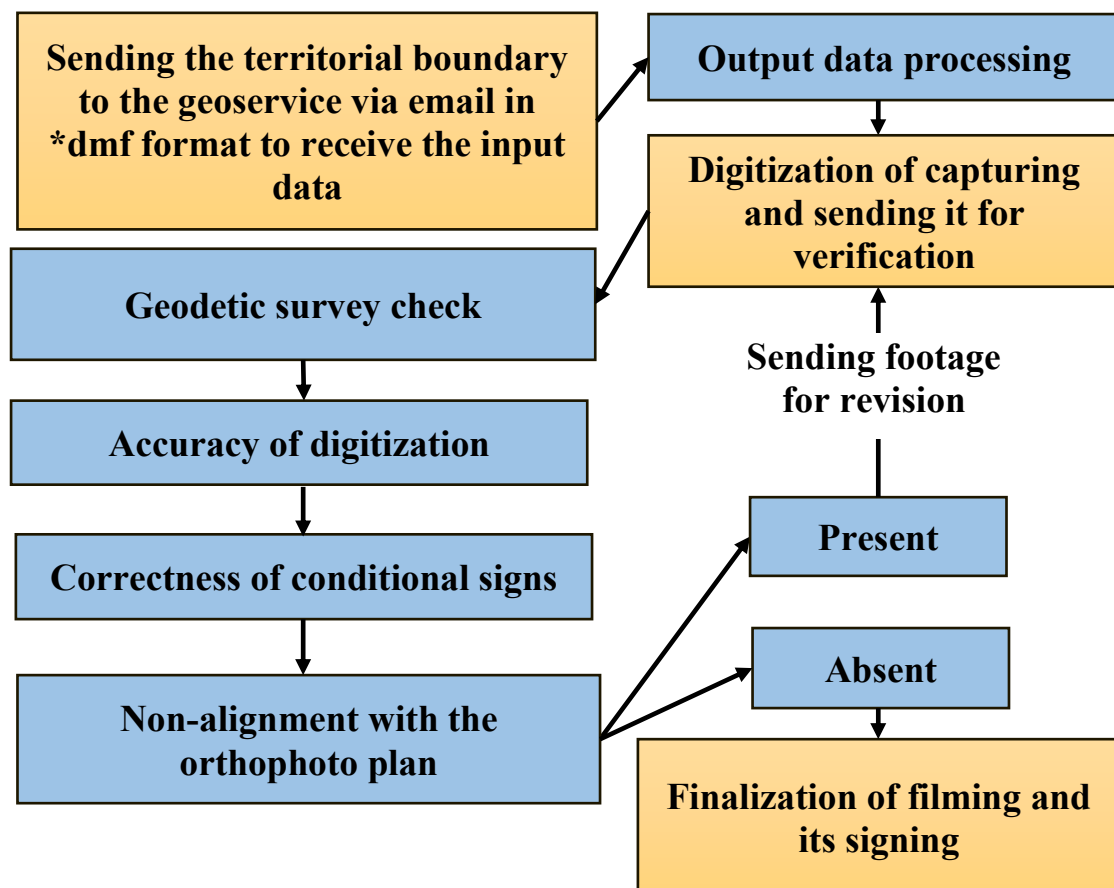
**The purpose of the article.** To analyze the advantages and problems of the geodetic electronic cabinet, determine the causes of these problems, indicate the respective ways of their solution, and outline the prospects for the development of the e-cabinet in the future.

**Materials and methods of scientific research.** In this study, the scientific method of analysis played a significant role. With its help, it was possible to determine the main advantages and disadvantages of the geodesist's electronic cabinet. The historical and comparative method of scientific research was also widely used, as the digital transformation of topographic and geodetic works is the culmination of many gradual and correct decisions made in the past by relevant government bodies. The survey method played a noticeable role at the very beginning of the study and allowed, through communication with qualified employees of the architecture department, to gather as much important information as possible needed to write this article. Through the forecasting method, it was possible to determine the prospects for the development of the geodesist's electronic cabinet, to see it not only as it is now but as it can be in the future if it utilizes its full potential.

The study used materials from topographic surveys, land plot plans, and executive surveys across the entire Lviv region. General plans and detailed plans of territories were studied to better understand the issues of red lines. Regulatory and legal acts [1, 3, 10, 13, 14] regulating urban planning processes in Ukraine, geospatial data infrastructure, topographic and geodetic, and cartographic activities were also analyzed, as well as numerous scientific articles analyzing topics similar to ours.

**Research results and discussion.** To enumerate all the advantages of the geodesist's electronic cabinet, one must delve into a historical excursion. It is necessary to understand how, before its creation, the process of coordinating such graphic materials as land plot plans, topographic, and executive surveys took place. The structural department of architecture was responsible for checking all the above-mentioned surveys. In the Lviv regional department of architecture, this is the geoservices and engineering networks sector of the Lviv city council.

When there was no geodesist's cabinet yet, the entire process of communication between the geoservices sector and land management organizations took place through email, and the process of submitting and coordinating plans and surveys in Lviv occurred as shown in Fig. 1.



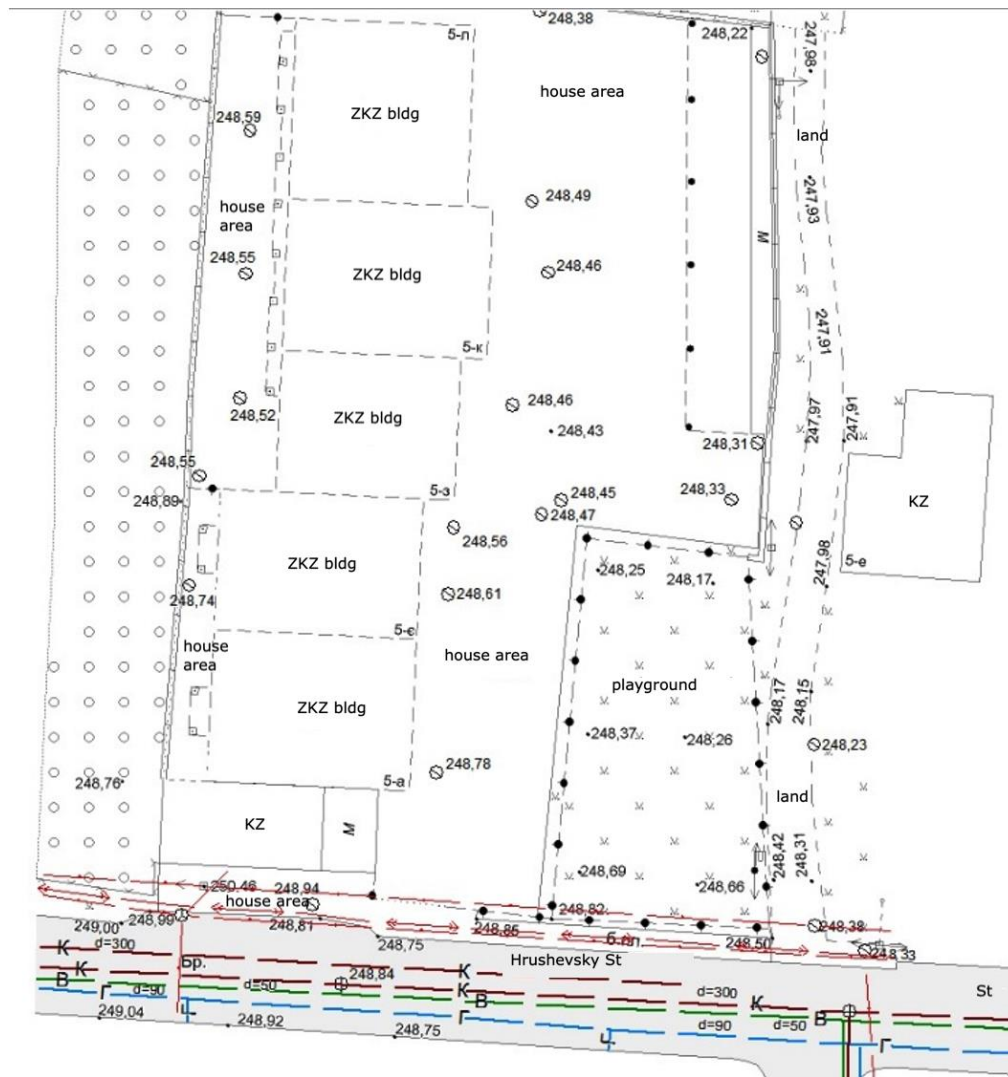
**Fig. 1. The process of submitting and approving topographic and geodetic works prior to the creation of the geodesist's e-cabinet**

As shown in Fig. 1, the company sent the corresponding \*.dmf file to the geoservice by mail, in which the territory boundary for obtaining the source data was

marked in the Digital software. These source data consisted of two parts - a raster image of the claimed territory in \*.tif format and a file with communications in \*.dmf format. The raster image was an old topographic survey of the entire city of Lviv with buildings, streets, communications, etc. The surveyor overlaid his new survey on it, and to digitize a larger area, he processed the old topographic base around the plot together with the communications marked there. This maximizes the filling of geospatial data in the selected area for surveying [3].

According to the geoservice requirements, the survey should extend at least twenty meters from the land plot boundary. After the survey was fully digitized in the Digital software, it was sent to the geoservice for verification. The respective specialist checked the correctness of the processing, whether the correct symbols were used, etc.

An important part of the verification is to overlay the digitized survey on the existing orthophotomap and check for inconsistencies between them. If there were any, the survey was sent for further processing; if not, the geoservice accepted the survey and marked it with red lines. Then the surveyor formalized it as a land plot plan or topographic or executive survey and submitted it for signing to the geoservice and engineering networks sector. It is important to note that the geoservice incorporates all new accepted surveys into the Unified Digital Topographic Resource (UDTR) (Fig. 2), which is an entirely new topographic base with communications for the entire Lviv territorial community. The file of communications provided by the geoservice in the source data consists of engineering networks that are already included in the UDTR. Almost everywhere in Lviv, there is already an UDTR, which is provided to the land management organization as source data in the form of a raster image in \*.tif format for the territory selected by it, instead of the outdated topographic base. Thus, the Unified Digital Topographic Base ensures the filling and functioning of geospatial data infrastructure at the local level through surveys and plans at a scale of 1:500 [10].



**Fig. 2. Fragment of a unified digital topographic base in one of the cities of the Lviv region**

In 2020, the first electronic cabinet of a geodesist in Ukraine was launched on the website of the urban cadastre of Lviv [11]. It stopped operating with the beginning of the full-scale invasion of the Russian Federation into Ukrainian territory, but resumed its operation from January 1, 2024. By analyzing the process of coordinating graphical materials before its creation, it is now possible to clearly identify the advantages and problems of the geodesist's electronic cabinet. On its main page, one can immediately see the survey numbers, their addresses, type, and status (Fig. 3). The survey can have seven statuses, and each of them is assigned its own color - for issuing original data, reserved, issued original data, under review, reviewed, canceled, entered into the Unified State Cadastral Register. Previously, the survey number and its status

were reported via email. Now all information is available immediately in the online service.

Nr	Address	Status	Type of work
202401622	Lviv, tract "Klepariv"; SC;"Recreation";	Entered into UDTR	Other type of work
202401618	Vynnyky, 62-a Halytska St	Entered into UDTR	Topographic survey

**Fig. 3. Geodesist's electronic cabinet interface screenshot.**

Also, on the main page, there are two important columns - survey materials and actions. In the survey materials column, you can download the raw data issued by the geoservice, as well as the file of the completed survey and the verified file. The actions column is used to upload the survey for verification.

Another useful column is called "signatures." If geodesists used to submit plans of land plots, topographic and executive surveys for signatures to geoservice employees and didn't know when they would be signed, now, when a specialist signs the survey, they immediately make a note in the aforementioned column that it has been signed.

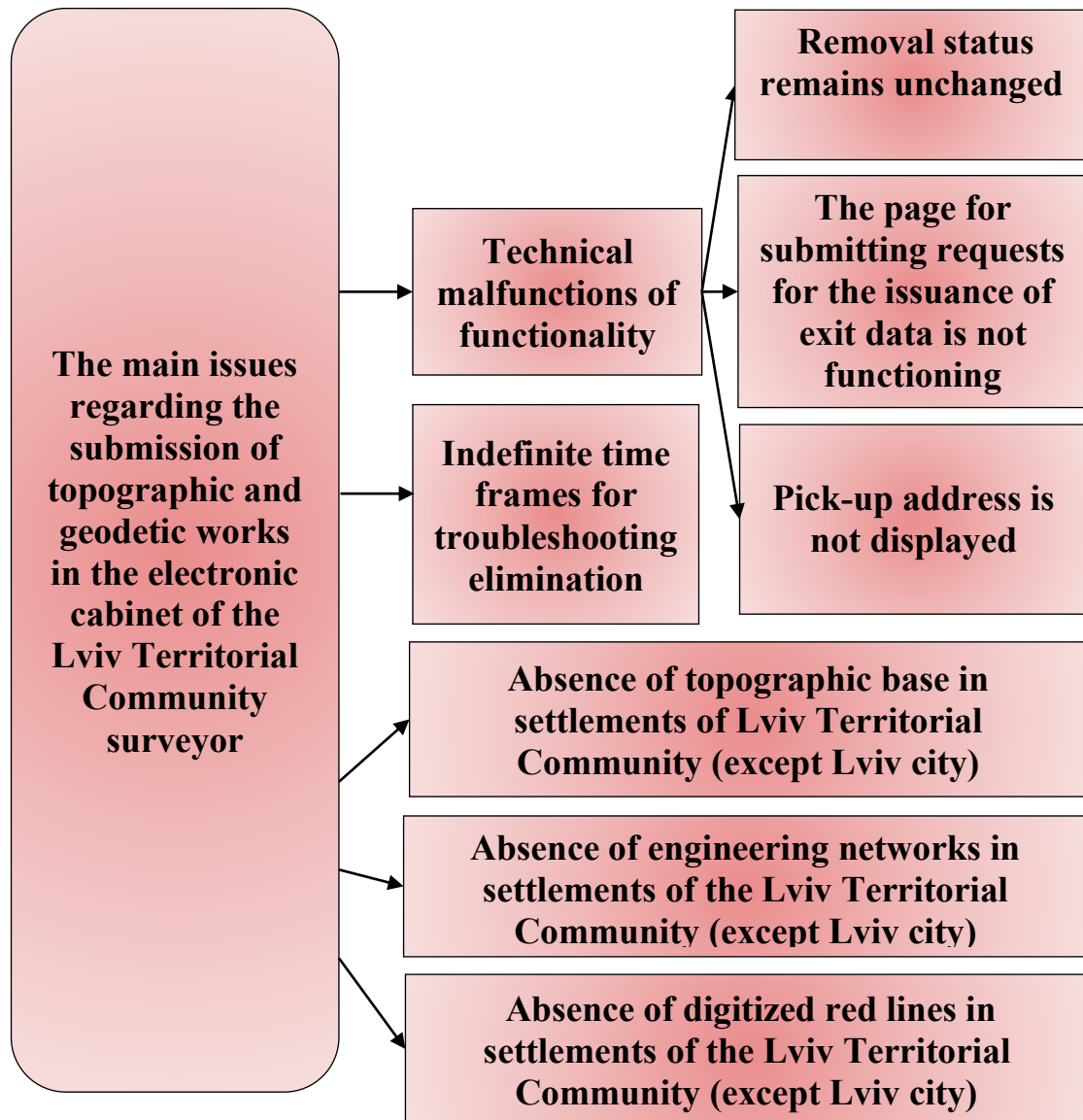
All surveys are now available in one online service, so there is no need to search for each survey extensively in email, and there is no need to maintain your own list of tasks in \*.XLSX format. The geodesist's cabinet is such a list of tasks, in a convenient tabular format. In addition, it allows canceling your own survey for various reasons if it is still in the status of issuing raw data. If the survey has already been issued, then you need to call the geoservice sector specialist who will cancel it through their special access.

The geodesist's electronic cabinet has separate functionality for submitting raw data. By using it, a new web page will open where you can submit an application. This page is shown in Fig. 4. If raw data were ordered via email in \*.dmf format, now there is an option to submit new applications, specifying the required boundary by immediately marking it on the map, which is depicted in Fig. 4.





Since this online service was created recently, technical breakdowns occur, such as the output data submission button not working, the survey status not changing, and the survey name not being displayed. There have been instances where service issues persisted for a week or more, negatively impacting the efficiency of cadastral organizations' work.



**Fig. 5. Main Challenges of Submitting Topographic-Geodetic Works in the Geodesist's E-Cabinet**

With the final formation of the Lviv territorial community [12], the electronic cabinet of the geodesist began to accept surveys throughout the community's territory. Immediately, difficulties arose in the process of submitting topographic-geodetic works. These difficulties are associated with the fact that all settlements of the Lviv

territorial community, except for the city of Lviv, do not have either a new or an old topographic base. That is, there are no raster data from which engineering networks and the situation around measured land plots could be plotted. The geoservice sector found a solution to this problem as follows:

- It was decided to create a database of Unified Digital Topographic Resource (UDTR) throughout the territorial community's territory, not just in the city of Lviv.

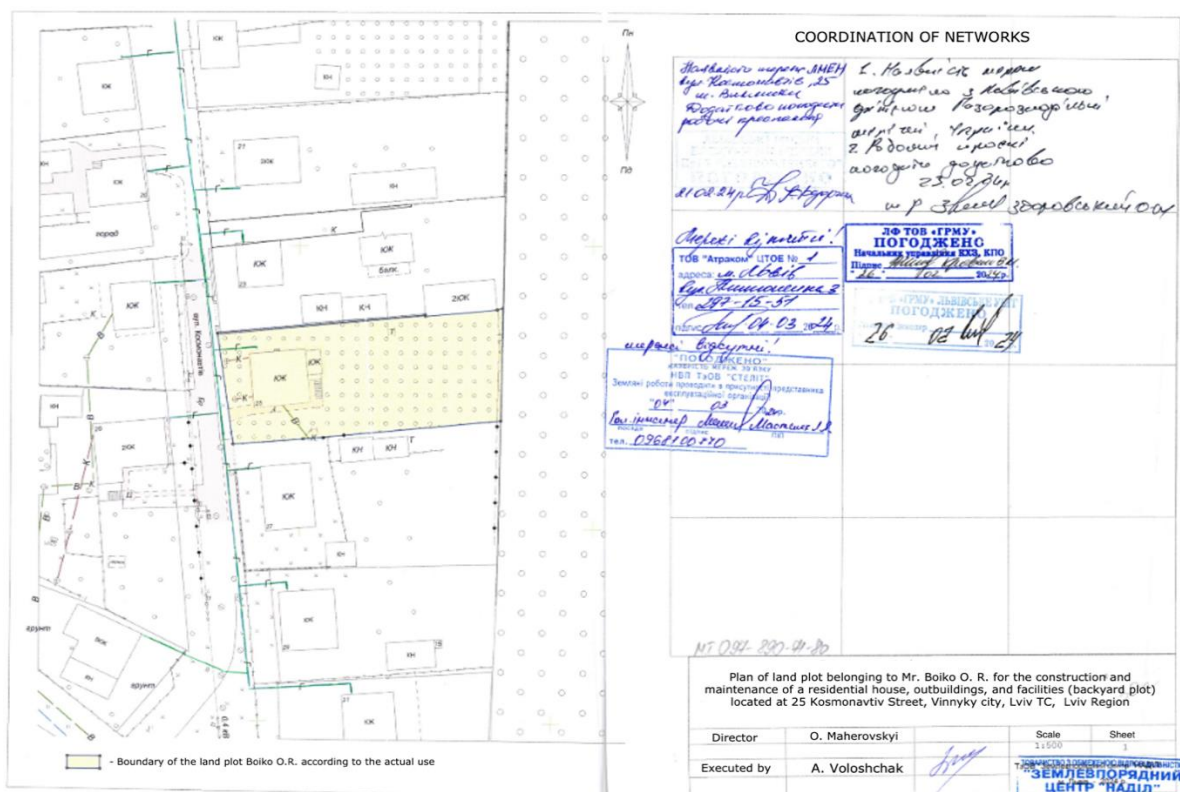
- Surveys in the territory of the territorial community, except for Lviv, could have a radius of less than twenty meters from the boundary of the measured land plots, but there were still instructions to measure neighboring and adjacent territories to the research object in order to more quickly populate the UDTR database.

- The absence of raster materials from which communications could be plotted led to the decision that each survey must have approval from the respective municipal services, and it was they who were responsible for plotting engineering networks on the territory requested by the customer.

- Surveys without network approvals are not accepted for verification and are not signed, except for the city of Lviv, where an almost complete UDTR with communications is already formed.

- As a minimum requirement, gas, water, and sewage must be approved. If there is no water, then the well from which the homeowners draw water must be indicated. If there is no sewage, then a septic tank must be indicated.

Following the sector of geoservice's adoption of such decisions, land management organizations began printing network coordination plans and contacting municipal services to have them manually mark the communications on the plans and affix stamps, as without them, the surveying will not be verified and included in the UDTR. This coordinated network plan was then scanned, and the manually marked communications were digitized and overlaid in the Digitals software onto the measured and processed digital survey. A photo example of a network coordination plan with communications from the respective municipal services can be seen in Fig. 6.

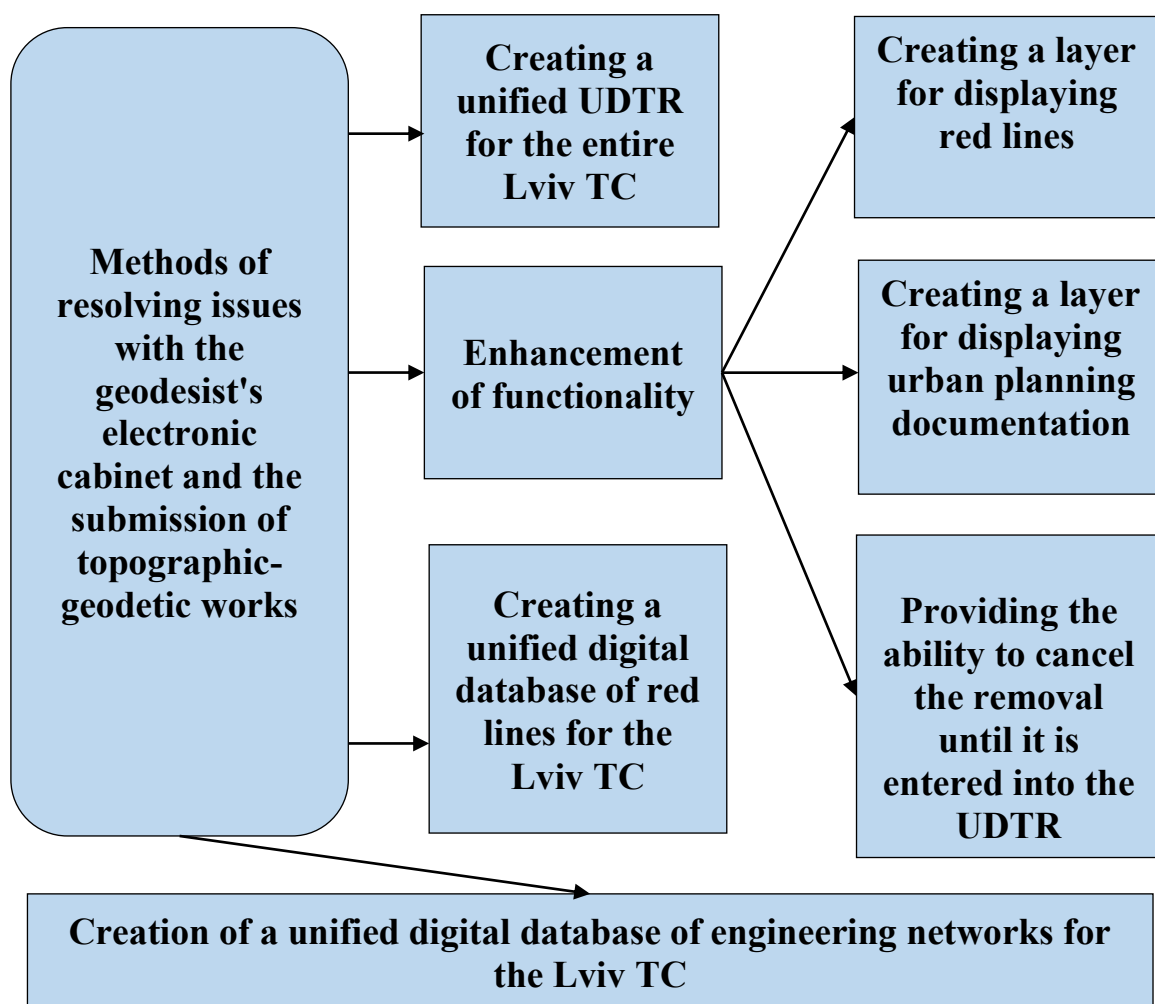


**Fig. 6. Photo - an example of network coordination plan with gas lines and corresponding stamps**

The final formation of the Lviv TC brought another significant issue that directly affected the submission of topographic-geodetic works. This concerns the absence of digitized red lines everywhere except in the city of Lviv. Since red lines are clearly regulated by urban planning documentation [13-14], in order to address this issue, all settlements within the community transferred their general plans and detailed territory plans to the sector of geoservice and engineering networks of the Lviv City Council. Analyzing the general plans and detailed territory plans, the geoservice will create red lines throughout the territorial community, but difficulties arise here as well. They are related to the fact that many general plans are outdated and do not reflect new streets. And if there is no detailed plan for the required survey, then it turns out that red lines cannot be established there. Specifically for such territories, the geoservice allows the creation of land plot plans, but with a note that according to the transferred urban planning documentation, red lines are not established in these areas. All general plans and detailed territory plans of the Lviv Territorial Community can be viewed on the website of the urban cadastre of Lviv [11].

When the surveyor's office resumed its work on January 1, 2024, a very useful function appeared in it. It involved the ability to turn on the layer of red lines when submitting initial data and see if they are established in the territory you need or not. But for unknown reasons, it was almost immediately disabled and the layer of red lines removed, although the function itself was useful and informative for many land management organizations.

All pathways to resolving the issues that arose during the investigation of the surveyor's e-cabinet and the entire process of submitting topographic-geodetic works are shown in Fig. 7.



**Fig. 7. Solutions for issues related to the geodesist's e-cabinet**

According to Fig. 7, the solutions to the problems lie in improving the functionality of the geodesist's e-cabinet over time, as well as creating a unified UDTR and a unified database of cadastral boundaries and engineering networks for both the Lviv Regional State Administration and, in the future, for the entire Ukraine.

The electronic geodesist's cabinet has positively impacted every stage of delivering topographic and geodetic works – from issuing initial data to their signing. Due to its informativeness and functionality, the speed of execution and verification of surveys has increased significantly. The geodesist's cabinet has helped all land management organizations organize their topographic and geodetic work in one place, creating a unified system from them. Its creation has increased the efficiency of both the geoservice sector and engineering networks, as well as land management and geodetic firms. Due to its uniqueness, occasional technical breakdowns occur, but their occurrence is entirely expected, as every new system experiences glitches at the beginning of its existence, which over time will become minimal or non-existent.

**Conclusions.** Significant issues with delivering surveys through the electronic geodesist's cabinet arose due to the formation of the Lviv Regional State Administration. The lack of topographic base in all settlements, as well as processed and digitized cadastral boundaries (except for the city of Lviv), became serious problems on the path of delivering and signing topographic and geodetic works. However, the geoservice sector immediately took steps to address them and began searching for the most optimal and rapid solutions. The creation of UDTR for the entire Lviv Regional State Administration began. Through the analysis of master plans and detailed plans of the territory, work on establishing cadastral boundaries in all community settlements was activated. Where it is not possible to establish them due to the lack of documentation, plans of land plots are allowed to be submitted with a note that the cadastral boundaries are not established. The geoservice sector has carried out productive work in solving problems and is doing everything possible to ensure that customers of documentation do not wait long for the approval of their topographic and geodetic works.

In the future, an UDTR with communications for the entire Lviv Regional State Administration will be formed, and cadastral boundaries will be established everywhere through the analysis of old and creation of new master plans and detailed plans of the territories. Already now, it would be useful to add several useful layers to the map on which organizations mark the boundaries of polygons for issuing initial



data. In particular, a layer of cadastral boundaries and a layer of urban planning documentation would be useful so that geodesists could immediately see the situation with cadastral boundaries in the territory they are going to process. If they are not there, a layer of master plans and detailed plans of territories would come in handy, which will show whether they can be established there at all or not. If they can, then wait for them; if not, then submit plans of land plots with appropriate notes that the cadastral boundaries are not established. Undoubtedly, it would be useful to allow land management organizations to cancel surveys that have not yet been entered into the UDTR, not only when they are in the status of issuing initial data, because unforeseen circumstances may arise in any work that make it no longer relevant.

Overall, the electronic geodesist's cabinet has already become an indispensable online service for delivering topographic and geodetic works in the Lviv Regional State Administration today. There is no doubt that in the future it will be introduced in more and more territorial communities, and the electronic cabinet itself, taking into account proposals from experts and practitioners, will become increasingly perfect, efficient, and better.

### **References**

1. Verkhovna Rada of Ukraine (1999, January 26). Zakon Ukrainy “Pro topohrafo-heodezychnu i kartohrafichnu diialnist” [A law of Ukraine is “On Topographic, Geodetic, and Cartographic Activities”]. Holos Ukrainy [Voice of Ukraine].
2. The First Online 'Geodesist's Office' in Ukraine Created Based on the Geoportal of Lviv City. Available at: <https://www.032.ua/news/2837080/na-bazi-geoportalu-mista-lvova-stvorili-persij-v-ukraini-kabinet-geodezista-onlajn>
3. Verkhovna Rada of Ukraine (2020, May 7). Zakon Ukrainy “Pro natsionalnu infrastrukturu heoprostorovykh danykh” [A law of Ukraine is “On the National Infrastructure of Geospatial Data”]. Holos Ukrainy [Voice of Ukraine].
4. Artemov, V., Movchan, T., Bakhchevan, E., & Danko, T. (2020). Pryntsypy tsyfrovoi transformatsii i vprovadzhennia yii v heodezii ta zemleustroi [Principles of Digital Transformation and Its Implementation in Geodesy and Land Management].

Agrarian Herald of the Black Sea Region, 96, 129-138. DOI: <https://doi.org/10.37000/abbsl.2020.96.16>

5. Putsenteilo, P., Kostetskyi, Y., & Bryk, M. (2022). Digitization of land resources management: World experience and domestic realities. *Innovative Economy*, 4, 20–28. DOI: <https://doi.org/10.37332/2309-1533.2022.4.3>

6. Bakai Yu. Yu. Natsionalna infrastruktura heoprosorovykh danykh Ukrainy. [National Infrastructure of Geospatial Data of Ukraine]. DOI: <https://doi.org/10.30525/978-9934-588-63-1.01>

7. Karpinkyi, Y., & Lazorenko-Hevel, N. (2020). Geodesy, cartography and aerial photography. *Geodesy, Cartography and Aerial Photography*, 92, 24–36. DOI: <https://doi.org/10.23939/istegcap2020.92.024>

8. Yemelianova, O., Tytok, V., & Lavrukhina, K. (2023). Reforma mistobuduvannia Ukrainy [Urban Planning Reform in Ukraine]. *Economics and Society*, 50. DOI: <https://doi.org/10.32782/2524-0072/2023-50-28>

9. Khar, M. I. (2023). Problems of public administration in the sphere of urban planning activities in Ukraine and their solution directions. *Scientific Notes of Taurida, Vernadsky University, Series "Public Administration"*, 2, 91–95. DOI: <https://doi.org/10.32782/tnu-2663-6468/2023.2/15>

10. Cabinet of Ministers of Ukraine (2021, June 1). Postanova Kabinetu Ministriv Ukrainy “Pro zatverdzhennia Poriadku funktsionuvannia natsionalnoi infrastruktury heoprosorovykh danykh” [A resolution of the Cabinet of Ministers of Ukraine is “On the Approval of the Procedure for the Functioning of the National Infrastructure of Geospatial Data”]. *Uryadovy Kuryer* [Governmental Courier].

11. Lviv City Urban Cadastre. Available at: <https://mbk.city-adm.lviv.ua/home>

12. Verkhovna Rada of Ukraine (2015, March 4). Zakon Ukrainy “Pro dobrovilne obiednannia terytorialnykh hromad” [A law of Ukraine is “On the Voluntary Amalgamation of Territorial Communities”]. *Holos Ukrainy* [Voice of Ukraine].

13. Verkhovna Rada of Ukraine (2011, March 12). Zakon Ukrainy “Pro rehuliuвання mistobudivnoi diialnosti” [A law of Ukraine is “On Regulation of Urban Planning Activities”]. *Holos Ukrainy* [Voice of Ukraine].



14. Verkhovna Rada of Ukraine (1992, December 9). Zakon Ukrainy “Pro osnovy mistobuduvannia” [A law of Ukraine is “On the Basics of Urban Planning”]. Holos Ukrainy [Voice of Ukraine].

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## **ПЕРЕВАГИ ТА ПРОБЛЕМИ ЕЛЕКТРОННОГО КАБІНЕТУ ГЕОДЕЗИСТА ЛЬВІВСЬКОЇ ТЕРИТОРІАЛЬНОЇ ГРОМАДИ**

**Анотація:** У статті проаналізовані основні переваги та недоліки електронного кабінету геодезиста – нового онлайн-сервісу для здачі топографо – геодезичних робіт у Львівській територіальній громаді (ТГ). Показана його роль як в цифровій трансформації, так і в створенні місцевої бази геоінформаційних даних. У процесі дослідження була виявлена його велика ефективність, інформативність та зручність на кожному етапі роботи із зніманнями – від видачі вихідних даних і до самого їх підписання. Щоб краще усвідомити переваги онлайн – сервісу був проаналізований процес здачі топографо-геодезичних робіт ще до його створення. У процесі наукового аналізу були виявлені також проблеми із доступом до електронного кабінету геодезиста. Наведено приклади доволі частих технічних збоїв на сайті через його відносну новизну, що на деякий час взагалі зупиняло увесь процес виконання знімань. У статті показано як із утворенням Львівської ТГ ускладнився процес здачі та підписання топографо-геодезичних робіт через електронний кабінет. Виявлена повна відсутність цифрової топографічної основи, яка б годилася для опрацювання та здачі знімань у всіх населених пунктах громади, окрім міста Львова. Досліджено та визначено шляхи вирішення двох критичних проблем, які значно уповільнюють процес здачі робіт у Львівській територіальній громаді: проблему червоних ліній та проблему інженерних мереж. Спрогнозовано, що у майбутньому усе більше територіальних громад будуть використовувати електронний кабінет геодезиста для здачі топографо-геодезичних робіт до органів місцевого самоврядування.

**Ключові слова:** електронний кабінет геодезиста, цифрова трансформація, топографо – геодезичні роботи, Львівська ТГ, інженерні мережі, червоні лінії, топографічна основа, сектор геослужби та інженерних мереж.