Prospects of using Task management in design

Anastasia Stepanova and Liubov Shilova
Moscow State University of Civil Engineering, Yaroslavskoe shosse, 26, Moscow, Russia

E-mail: ShilovaLA@mgsu.ru

Abstract. The article discusses the possibility of organizing project management in design using the Revit and Wrike task manager, a corporate online service for collaboration and project management that allows users to plan projects, prioritize tasks, track the schedule of their implementation and interact with the team. At the same time, the algorithm for calculating time by tasks was developed in the Dynamo environment using the Python language.

1. Introduction
According to the active development of the practical use of online services for project management, the team and its understanding of the overall picture of the work on the project become the most important question. And the monitoring of assigned and completed tasks become the main factor of effective project management. There are a lot of research works about project management issues, using different software and a lot of attention is paid for using building informational modelling in construction. As usual BIM is used for modelling optimization of energy-efficient engineering solutions or building thermal comfort [1-10 and etc.]. So these works don’t use advantages CAD systems and BIM for project management. That’s why the purpose of this research work was to evaluate the possibility of organizing project management in design by using any CAD system with task manager program.

Project management usually starts with creating a Gantt’s graphs. Gantt’s graphs or charts are widely used for monitoring of assigned and completed tasks, which were invented in 1910 by Henry Gantt. The main advantages of using Gantt’s graphs include the following facts.

1. The use of Gantt’s graphs at the preparatory stage of the project allows to coordinate with all interested parties their roles and deadlines for the implementation of the necessary tasks to achieve the goal.

2. Gantt’s graphs clearly show the necessary resources, so it can be predicted the most stressful periods. The project executors can determine whether the deadlines for completing any tasks coincide by looking at the time frame of the project in a vertical plane, and they can create a schedule that reflects the total amount of necessary resources by using the software.

3. Gantt’s graphs provides an opportunity to track progress - this is its most important advantage. Any project manager will just have to look at the Gantt’s graphs to get all the information that he is interested in. Gantt’s graphs are designed to control and calculate the resources needed for the project.

The rapid development of information technology made it possible to automate the creation of such schedules and to use software in project management. So, for example, similar tasks were previously
solved with the help of software such as Microsoft Office Project, Spider Project, etc. The works were listed, their start dates and resources were assigned, dependencies were built. The result of the work was a beautiful Gantt’s graphs. The only drawback was that during the process of implementing the project, monitoring the current status of tasks required changes that could only be made by using another software and instant messengers (such as Outlook correspondence, calls, etc.).

At the same time, different task manager programs are actively introduced today. Thus, the purpose of this research work was to evaluate the possibility of organizing project management in design by using any CAD system with task manager program.

2. Methods and methodology
To achieve the goal the authors used Wrike online platform and Revit as a CAD system.

Wrike online platform allows for joint work on the project. So people living on different continents can be involved in the implementation of tasks within the same project. Wrike helps at any given moment to see the task status of each specific employee, and also provides the ability to upload third-party documents, comment on the information inside these files, respond to comments from the mail or through the platform itself.

Autodesk Revit is a software package for computer-aided design that implements the principle of Building Information Modeling (BIM). Designed for architects, designers and design engineers. It provides the possibility of three-dimensional modeling of building elements and flat drawing of design elements, creating custom objects, organizing teamwork on a project, from the concept to the release of working drawings and specifications.

Task time calculation algorithm developed in Dynamo using Python. Dynamo is a add-on for Autodesk Revit and speeds up and automatically does functions that can not be done in Revit.

Python is a high-level general-purpose programming language focused on improving developer productivity and code readability.

3. Results
The process automation scheme is shown in Figure 1. From Revit the volume indicators are loaded into the Dynamo algorithm, and an Excel file is prepared in advance, which is a table of rules for calculating the number of days. After running the script, a new Excel file is generated with a table where the time for its execution is calculated for each task. The resulting file is imported into Wrike. The result is a Gantt’s graph.

Figure 1. The process automation scheme
The contour of the building, which is cut into floors by slabs, is created in Revit by using the formative. Further, indicators for the total area and volumes are collected (Fig. 2.).

Another part of the input data is the rules table, where the main sections and names of the work, their stages (paths to them), sequences and time spent on a specific type of work per 1000 m² in days are prescribed (Fig. 3). In the algorithm, these values are directly dependent. Based on the total volume and time indicated in this table, the algorithm calculates the total time spent on a particular object.

**Figure 2.** The contour of the building and its volume indicators

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**Figure 3.** Table of rules - “Calculation of design work”
Turn to the algorithm. The start date of the first work is set (month. day. year.). The name of the generated Excel file is also given, so that it can be easier to find in the specified directory, after which the script is launched (Fig. 4). It is important that the script is started manually, otherwise the program may freeze.

Figure 4. Algorithm in Dynamo

In the folder indicated above, we find the Excel file for import into Wrike (Fig. 5), which was created on the basis of examples of imported files provided by Wrike. Note that each column is important.

Figure 5. A fragment of the table generated by the algorithm for import

Next, the table must be imported into Wrike and we can see that the roles of the project participants are found in the corresponding column, they must be assigned to the team members from the contact list in Wrike. Further, the platform independently notifies employees about the tasks that are assigned to them, sending them a message about it by mail.

As a result, a Gantt’s graph is formed (Fig. 6), which shows the dependencies and the sequence of work, as well as who is responsible for what.
Figure 6. Gantt’s graph

For example, Figure 7 shows a snippet of code in a Dynamo Python environment. In the algorithm itself, the code is hidden in the Python Script node block. This fragment connects the necessary libraries and modes used by the algorithm to calculate the duration of time.

Figure 7. Code snippet from a Python algorithm

4. Conclusions
The flexible schedule that results from this makes it possible to evaluate the workload of employees, and allows you to track the progress of the project.
All team members have access to this schedule. Having received a task, department heads can also add sub-tasks and assign responsible persons to them already within their units. Employees see what tasks are assigned to them, and for which of the points their colleagues are responsible. Also, all project participants understand the logic of work, the sequence of tasks. In this case, each employee involved in the project, Wrike sends an email notification that it is time to start the task as soon as it is his turn and the previous step of a specific project is completed.

Thus, the article illustrates the possibility of using CAD systems to automate the creation of work schedules. The proposed work algorithm can significantly reduce project implementation time.

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