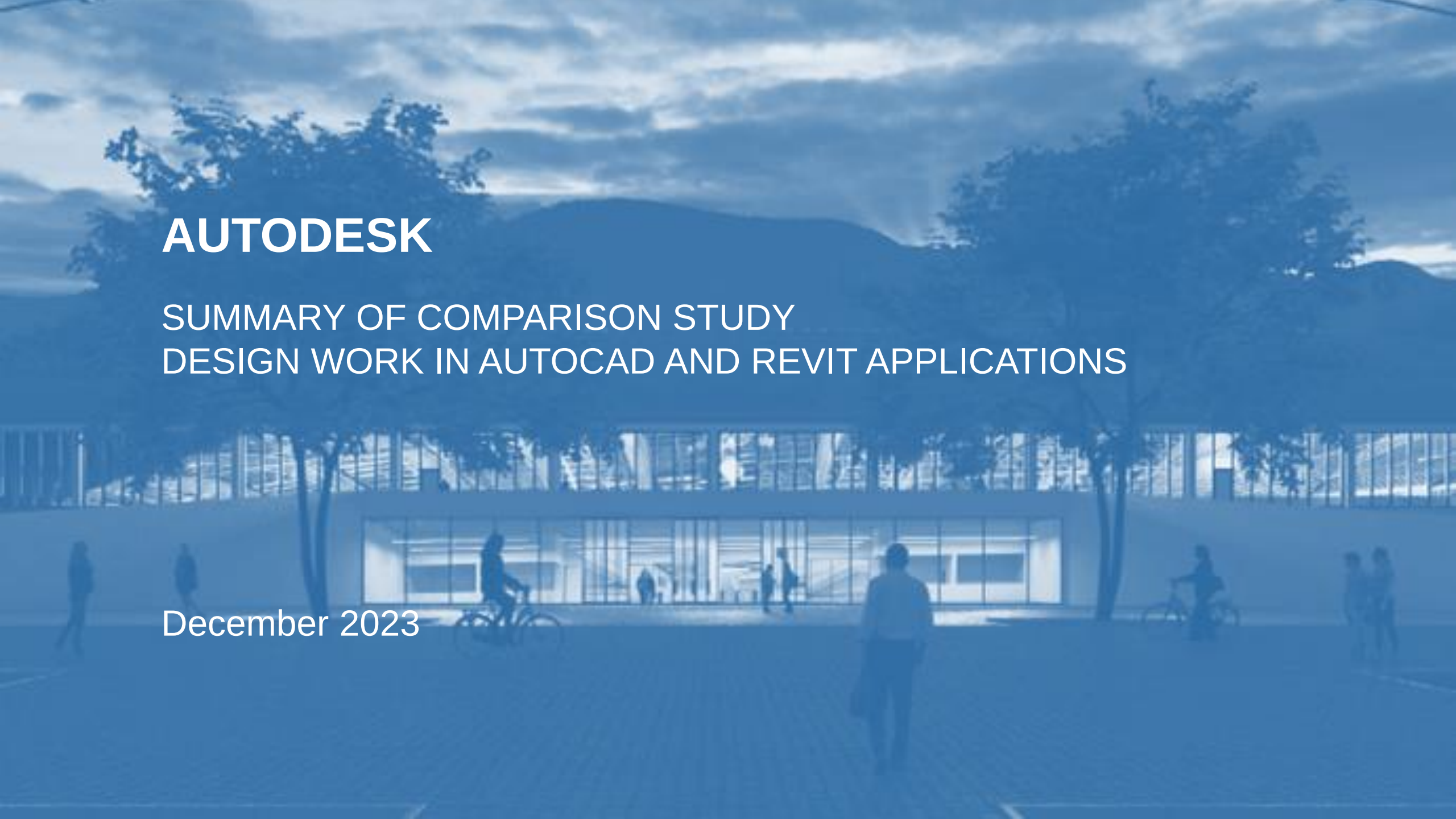

AUTODESK

SUMMARY OF COMPARISON STUDY
DESIGN WORK IN AUTOCAD AND REVIT APPLICATIONS

December 2023

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PROJECT OBJECTIVE AND STUDY DESCRIPTION

THE STUDY OBJECTIVE AND METHODOLOGY

OBJECTIVE
The goal of the study was to compare process of design work in 2D and 3D environments and its time reqirements for smaller construction project when using Autodesk applications AutoCAD and Revit.
The comparison primarily focused on the time demands of designing and process of drawing documentation, including changes implementation before project completion.
Another goal was to compare design and detailing feasibility and achieved outputs.

PROJECT
For the purposes of this comparative study, a smaller project was selected for which detailed documentation was already available.
The reason was to ensure a precise project specifications as well as the project design outputs and detailing which allows accurate comparison.

COMPARISON METHODOLOGY
The project was assigned to be processed in parallel by two designers, who had the task of independent processing of the project when using the same inputs. Both were requested to record videos of their work progress on monitors while working. The videos allowed to evaluate progress of the work as well as the time spent for the individual phases of the project.

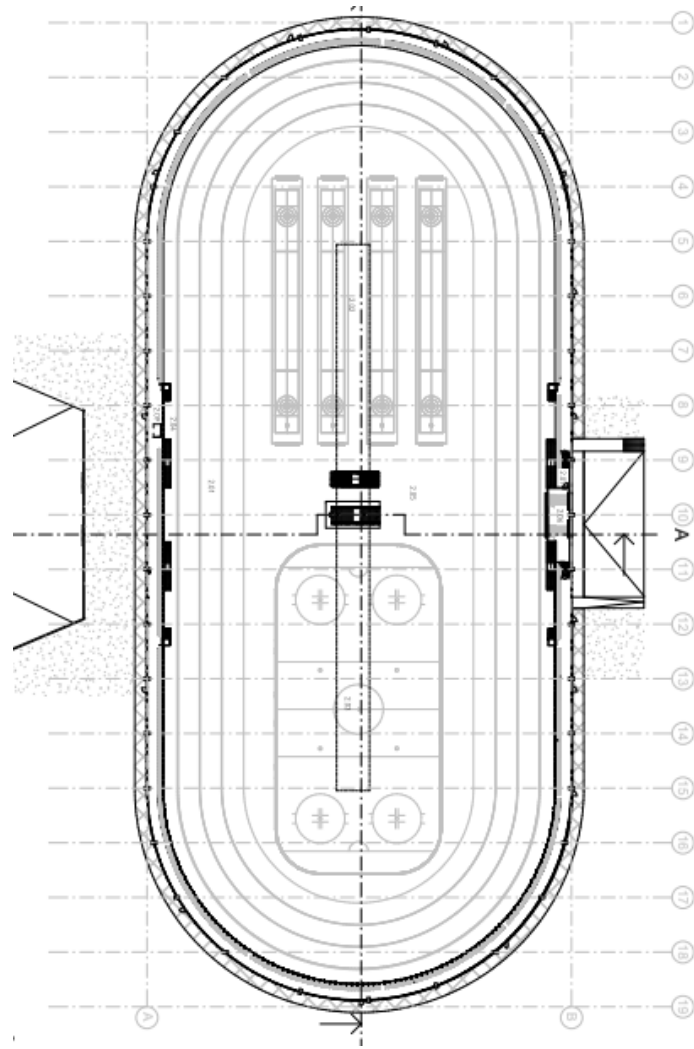
PROJECT DESCRIPTION

PROJECT
For the purposes of this comparison study, a smaller size building project was chosen – An Ice hockey arena also for curling and speed skating.

SCOPE
The required level of details and drawings was aligned with standard requirements for building permits.

In the final stage of project finalization, both designers were tasked to implement additional changes in the required layout of the building. This step allowed to compare the time and effort demands to incorporate changes.
The project is split into two parts: The building part and the HVAC system part.

DOCUMENTATION
Each designer had access to project documents - level of architectural study in PDF format, which could use as a base for work in 2D or in 3D.



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SUMMARY OF KEY FINDINGS

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TIME DEMAND
The total time required to deliver the project in both applications corresponds to the fact that the designers had precise specifications at the level of architectural study and PDF documents available.

It was found that processing the entire project in AutoCAD took 70% more time than in Revit.

FEASIBILITY
Both documentations created in the respective applications fully met the requirements and fulfilled the assignment.

WORK DEMANDS FOR CHANGES
It has been proven the changes in the project can be done significant more efficiently in Revit. It took four times less time.

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MAIN FINDINGS FROM PROCESING THE STRUCTURAL PART

OUTPUTS I STRUCTURAL PART I COMPARISON

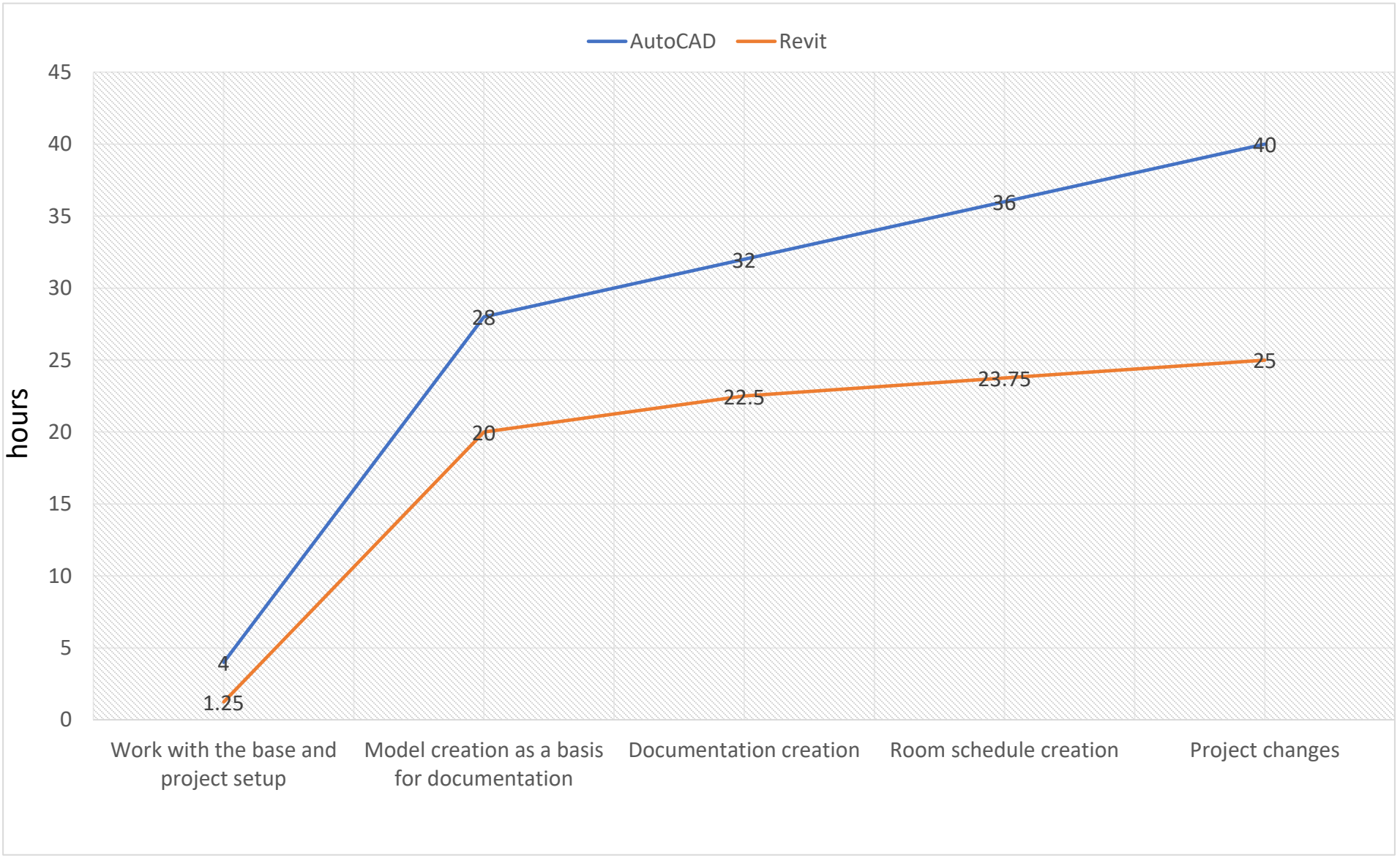
AutoCAD

Project phase	Description of work	Processing time
Work with the base and project setup	For each drawing, a new project was created, into which axes were imported as external references and a PDF file with the given drawing. It was necessary to create levels.	4 hours
Model creation as a basis for documentation	All architecture was created using known dimensions obtained from PDF files.	24 hours
Documentaion creation	Labels, dimensions, layouts, and corresponding levels were created.	4 hours
Room schedule creation	Room schedules were calculated using the area function in AutoCAD and then entered into Excel.	4 hours
Project changes	The change had to be modeled in each drawing separately, including dimensions and room schedules.	4 hours
		40 hours

Revit

Project phase	Description of work	Processing time
Work with the base and project setup	The project setup was based on an architectural template; according to the reference, the beginning was determined at the intersection of axes 1-A. Based on the PDF references, all axes and floors were subsequently created.	1,25 hours
Model creation as a basis for documentation	The creation of basic elements such as walls, doors, floors, columns, and others was proceeded quickly and without complication. The atypical roof and its relevant layers took more time because they were created using a general model and the "on desktop" method. It was also necessary to model the family of main beams, which were more complex in shape and size.	18,75 hours
Documentation creation	Creation of documentation was proceeded quickly because all labels and rooms can be applied in bulk; dimensioning takes most of the documentation creation time, but even though it is fast because chain dimensions function can be used. Creation of various sections and views takes only a few minutes.	2,5 hours
Room schedule creation	The room schedules are created with a few clicks, then divided into two floors so that each room schedule is assigned to the right floor plan.	1,25 hours
Project changes	Changes were made quickly because only a few walls and fixtures needed to be remodeled; the dimensions remained in place for the original walls, and new ones were only added in the new spots. The same applies to rooms.	1,25 hours
		25 hours

OUTPUTS I STRUCTURAL PART I COMPARISON



AutoCAD - 40hours

Revit - 25hours

FINDINGS I STRUCTURAL PART I COMMENTS

AutoCAD:

Design work of the structural part in AutoCAD was accomplished without any problems. The sample project documents in PDF format were inserted (already in the scale) into AutoCAD. A new axes were created as external references which helped in the placing of individual drawings. Design work was proceeded without issues. The most time-consuming aspects of the design was creation of the beams with a complex shapes. Another more demanding part was to create 3D views. The "array" and "mirror" functions were often used since most drawings were symmetrical.

The total time spent on modeling the structure part was close to 40 hours, including dimensioning, layout, and documentation.

Revit:

Design work of the structural part in Revit was accomplished without any problems. The sample project document was displayed on the second screen for the reference and modeling in Revit was done without using PDF files. The main beams, with specific shapes and dimensions, were a bit more complex part. The atypical roof was also created in a less conventional manner using a "roof by footprint." Other parts were modeled conventionally.

The total time spent on modeling of the structures was approximately 25 hours, including complete review of references and documentation.

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MAIN FINDINGS FROM PROCESSING THE HVAC SYSTEM

OUTPUTS I HVAC SYSTEM I COMPARISON

AutoCAD

Project phase	Description of work	Time
Work with the base and project setup	All documentation was created in coordination with the structural part of the project. The basis for the HVAC project was a drafted route with regards to the placed pit in the structure. Creation of the HVAC model was done in coordination with the base drawings, which was created as a building model in AutoCAD. New levels had to be created for better orientation in the project.	2 hours
Model creation as a basis for documentation	Piping tracing was done by creating lines and assigning them to the corresponding level. Fittings needed to be copied and their size changed using a scale. However, these fittings did not always match the actual conditions, so they had to be recreated. The same problem occurred with end elements. Collaboration with the construction part's designers and manual creation of corresponding sections were necessary for coordination.	24 hours
Documentation creation	Labels, dimensions, and layouts could not be applied in bulk. Describing multiple elements was not possible. Everything was done using curves, lines, and texts.	4 hours
HVAC schedules creation	The creation of pipe schedules took place outside of the AutoCAD software using manual measurement of route lengths. The number of end elements was determined through quick selection to define their properties, which, however, cannot be specified by custom parameter settings.	4 hours
Project changes	When implementing changes as route shifts, dimension adjustments, element replacements, new elements had to be created using curves/lines. Coordination the new elements had to be done again in alignment and collaboration with the structure design part. Schedules had to be recreated based on the changes made.	6 hours
Element creation	Elements used in the project were found on the manufacturers' websites. Therefore, it was not necessary to create them. Adjusting them to the specific needs of the project does not cause significant challenges as they consist of are only curves outlines of th objects only.	0 hours

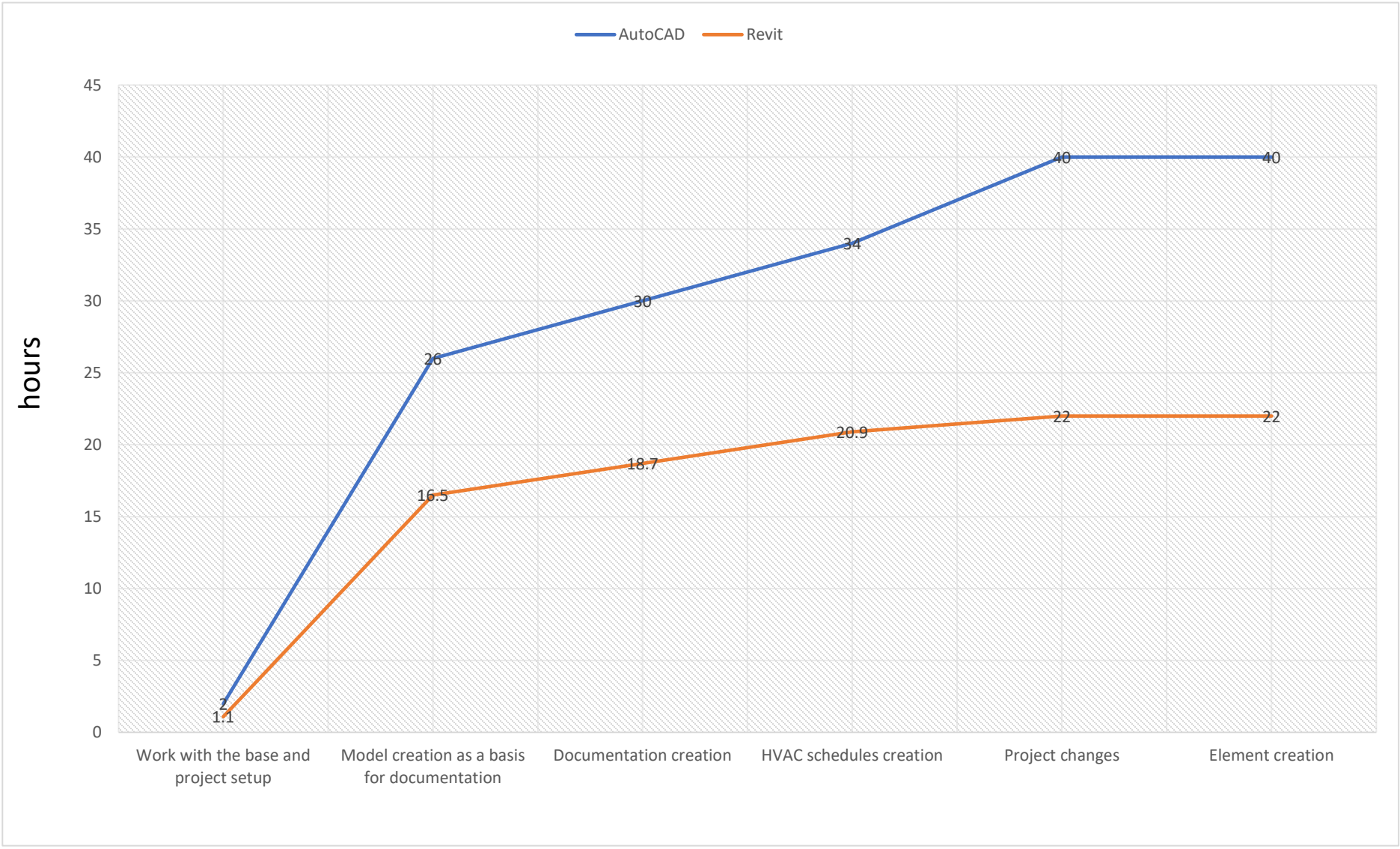
40 hours

Revit

Project phase	Description of work	Time
Work with the base and project setup	All documentation was created in coordination with the structural part. The basis for the HVAC project was a drafted route with regards to the placed pit in the structure. Creation of the HVAC model was done in coordination with the 3D model of the building part – all in Revit. All the necessary data were taken directly from this model (floors, coordinate system, rooms). These data allowed easier orientation in the model and can be used for future coordination between the the building part and any other MEP models.	1,1 hours
Model creation as a basiss for documentation	Piping tracing was done without problems, mainly thanks to the easy work with the actual dimensions of fittings and elements inserted into the project. Coordination of the air intakes and outlets was also straightforward as the main advantage of modeling in Revit is the easy creation of cuts, 3D views, or other displays suitable for easier orientation.	15,4 hours
Documentation creation	Labels, dimensions, and layouts can be applied in bulk. The model elements are connected with schedules that simplifies work when creating final documentation.	2,2 hours
HVAC schedules creation	When using the native function of schedules, we can easily determine which parameters we want to automatically obtain from elements (e.g., pipe length) without manual tasks. This function can be applied not only to the overall schedule of all elements in the model but also to a specific group of elements according to their predefined designation (fittings, mechanical devices, outlets, etc.)	2,2 hours
Project changes	When changes are made (pipe displacement, dimension adjustment, element replacement), the software responds smoothly and quickly. Changes are immediately implemented in all model parts, providing the designer with updated and comprehensive information about spacing or the need for piping coordination not only in 2D but also in 3D. Any accomplished changes are automatically implemented also in the schedules, so there is no need to rewrite them manually.	1,1 hours
Element creation	Elements and families used in the project were downloaded from the manufacturers' websites. Therefore, there was no need to create them. Element customization is not recommended as it could be complicated due to a lack of information of how they were created.	0 hours

22 hours

OUTPUTS I HVAC SYSTEM I COMPARISON



AutoCAD - 40hours

Revit - 22hours

OUTPUTS I HVAC SYSTEM I COMMENTS

AutoCAD :

The total time spent on modeling the HVAC system, including the placement of elements and documentation, was approximately **40 hours** in total.

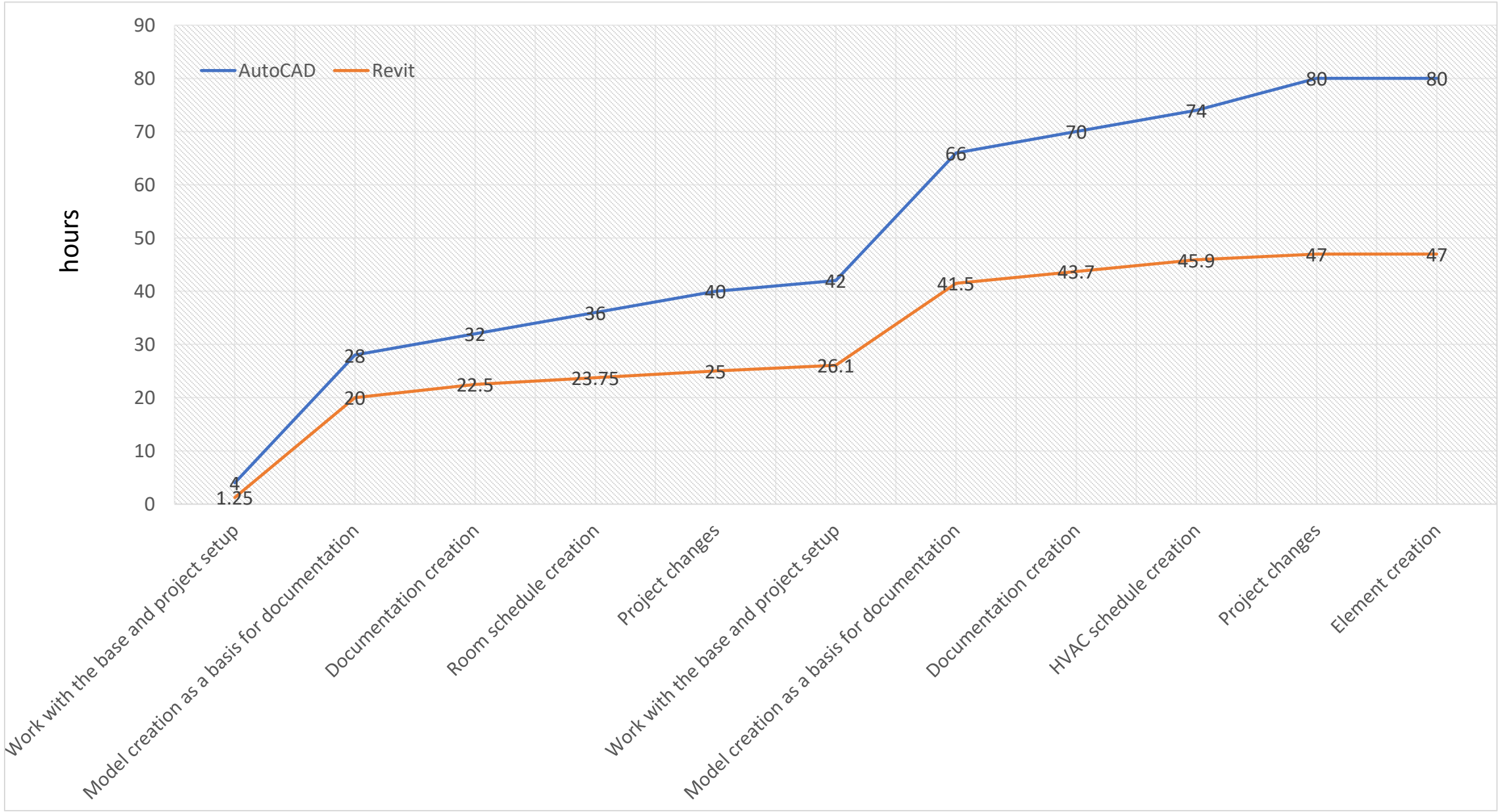
Revit :

The total time spent on modeling the HVAC system, including the placement of elements and documentation, was approximately **22 hours** in total.

5

MAIN FINDINGS FROM PROCESSING THE ENTIRE PROJECT

OUTPUTS I ENTIRE PROJECT I COMPARISON



CONCLUSION I THE ENTIRE PROJECT

This comparative study successfully compared the work of designers using both types of software: **AutoCAD and Revit.**

The quality of the final documentation processed in both applications met the required criteria and posed no feasibility issues.

Based on the recordings, it was found that the **time required for work in AutoCAD is 70% higher** for the entire project.

The comparison identified a significant difference in time requirements for implementation of project changes. **The changes in Revit application took 76% less time**.

CONCLUSION:
Project modeling in Revit is significantly faster and more efficient than project drafting in AutoCAD.

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