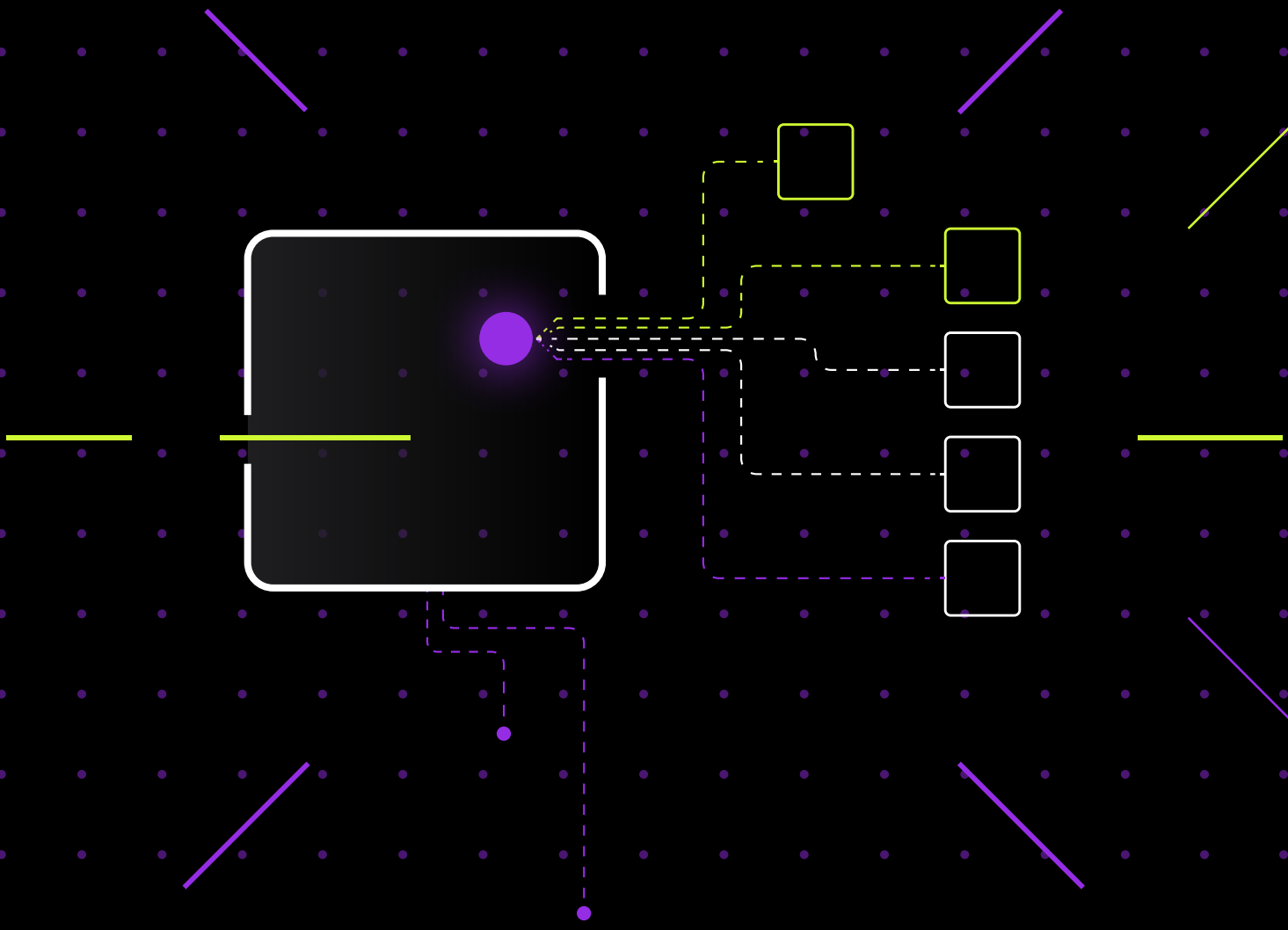
The Power of GoJS

A complete picture of GoJS diagramming library



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Introduction

Data informs business operations, enabling decision makers to make the best possible choices. Well-designed tools for visual data processing are a helping hand, and can make the difference between business success and business failure.

This e-book is dedicated to those who are already following the path of visualization. However, if you are just starting your journey into the world of interactive visual solutions, this publication is a good choice for you too.

Read our in-depth analysis of the GoJS library, which is a JavaScript library for building interactive diagrams and graphs on the web. It enables creating apps with flowcharts, org charts, BPMN, UML, modeling, and other visual graph types. Interactivity, data-binding, layouts and many node and link concepts are built into GoJS.

> **GoJS, created by developers for developers, quickly gain popularity as one of the most trustworthy solutions, and - as the need for data visualization tools kept growing - its career only sped up**

Northwoods Software
Creator of GoJS

You will learn practical information on the importance of Big Data in modern business, especially when it comes to the challenges today's entrepreneurs face. We'll explain what the GoJS library is and why JavaScript is the most valid language choice for building data visualization tools.

The topics below related to business benefits largely focus on the problems that the GoJS library solves, both in large enterprises and smaller organizations. You will see most of the use cases that accurately reflect the application of the GoJS library.

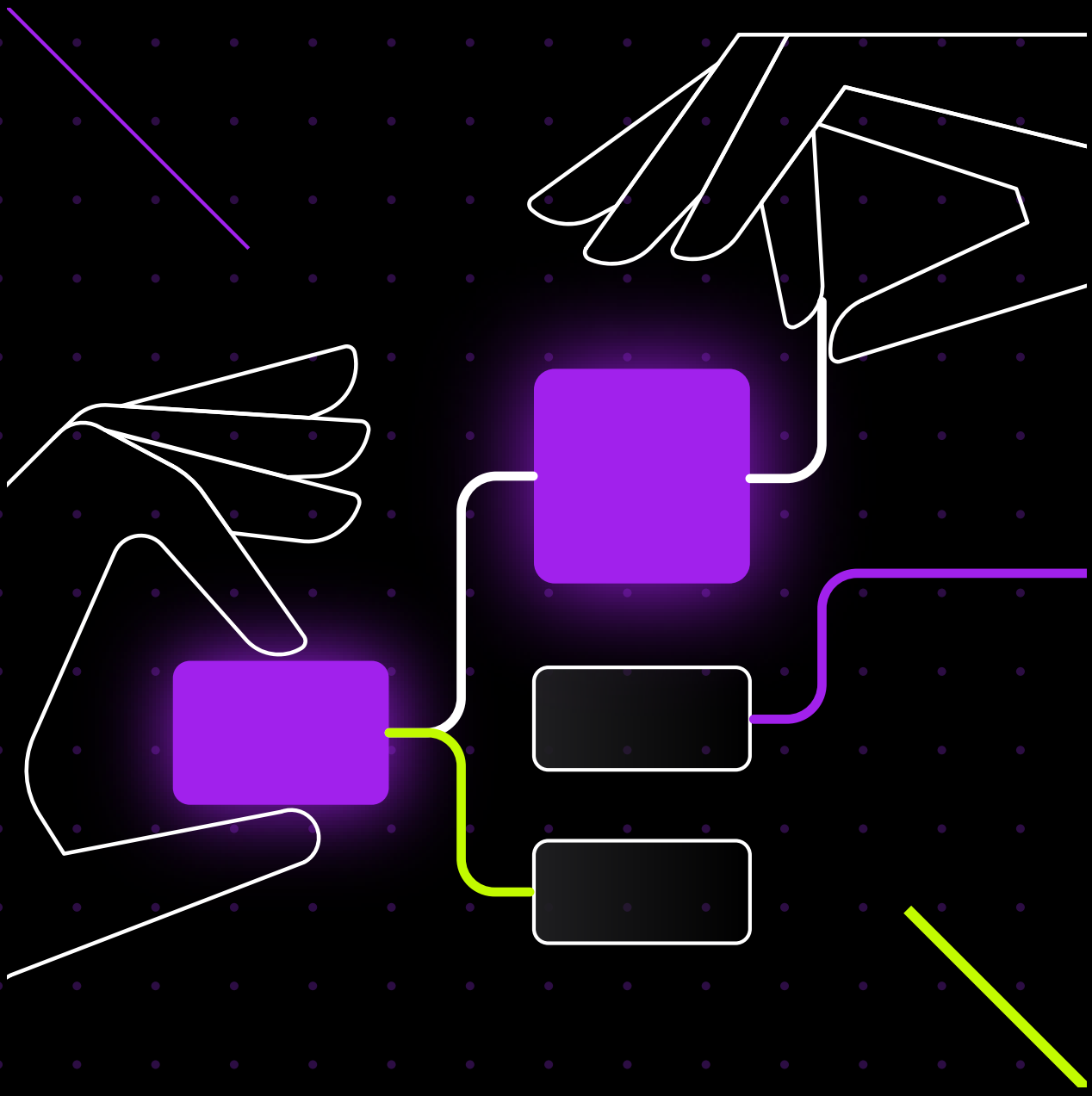
This e-book will explain the most outstanding advantages of the GoJS library in terms of performance, integrations, flexibility, and extensibility, along with comparisons to common competitors.

Use this e-book as a guide to the most important and useful functionalities for visualizations.

Welcome to the world of diagramming libraries and graphical solutions, and we wish you fruitful reading.

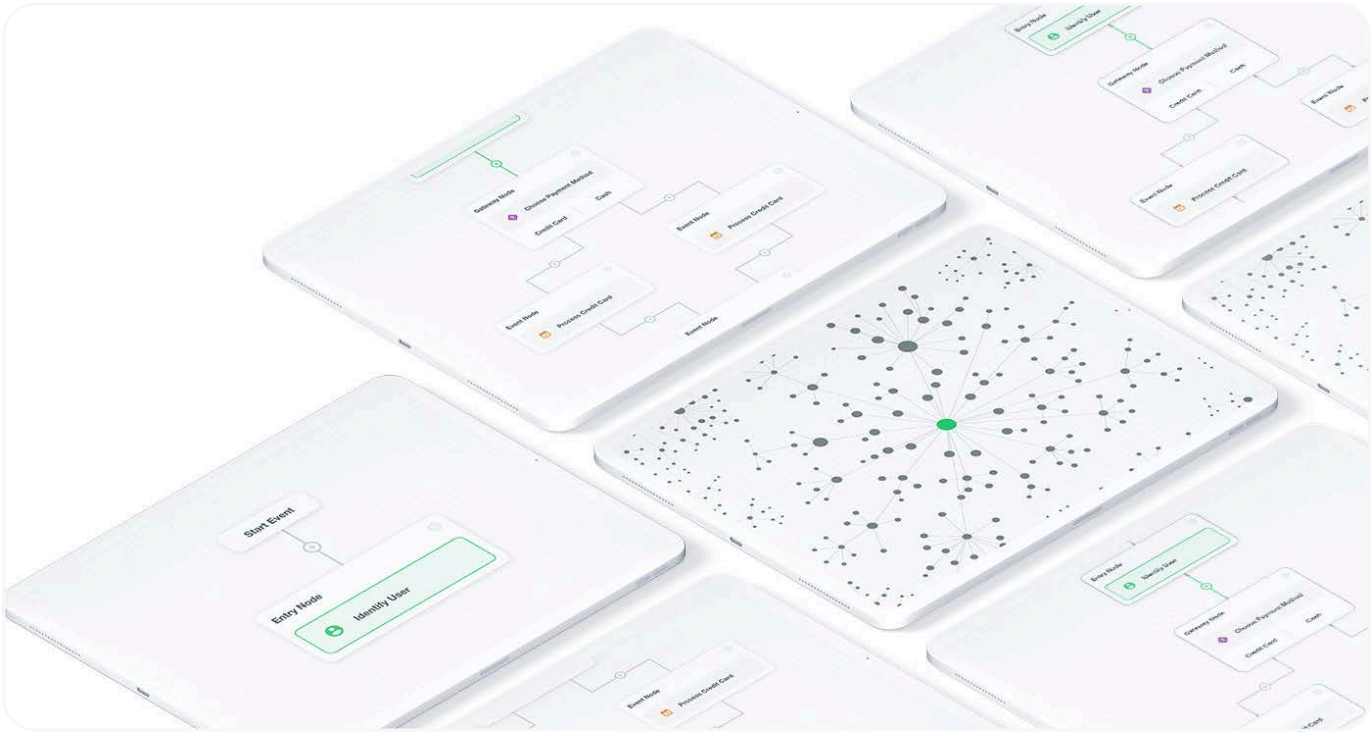
Synergy Codes Team

1 Introduction & Background



Big Data and the challenge of using it in business

It's all about data nowadays. As we entered the digital era, they rapidly gained importance and were hailed as the „new oil", the resource upon which the new digital age's business empires are being built. Silicon Valley realized this soonest, but others are following in its footsteps. While the shift created a hotbed of startups and new ways of doing things, with more traditional enterprises, **the idea is not to create new business models around data but to improve existing ones**. And that is not an easy task.

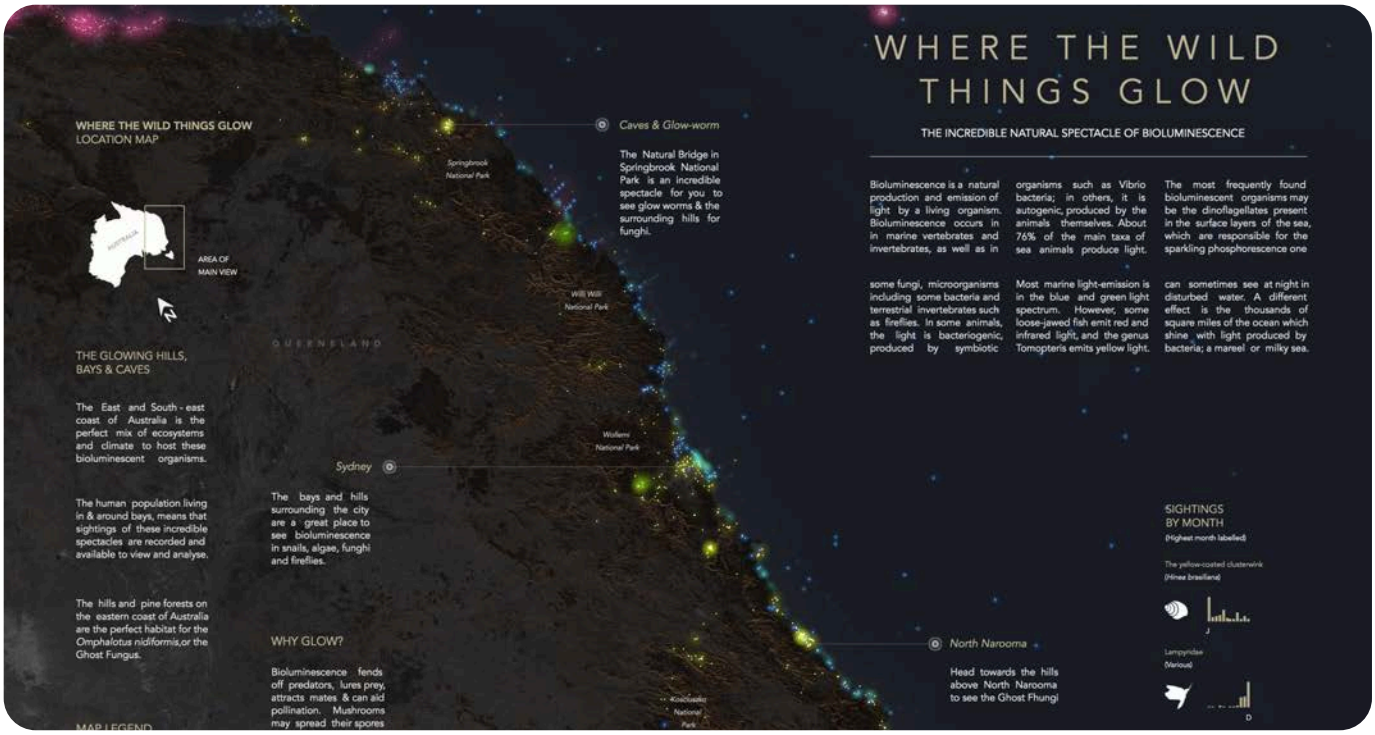


When we think about data, companies such as Google and Facebook come to mind almost automatically. Those once beloved but now widely criticized giants made a truly **sinister art-from of collecting data and monetizing it**. And it is not just about micro-targeted digital ads that haunt us for months on end across the web, but also about absolutely every aspect of their

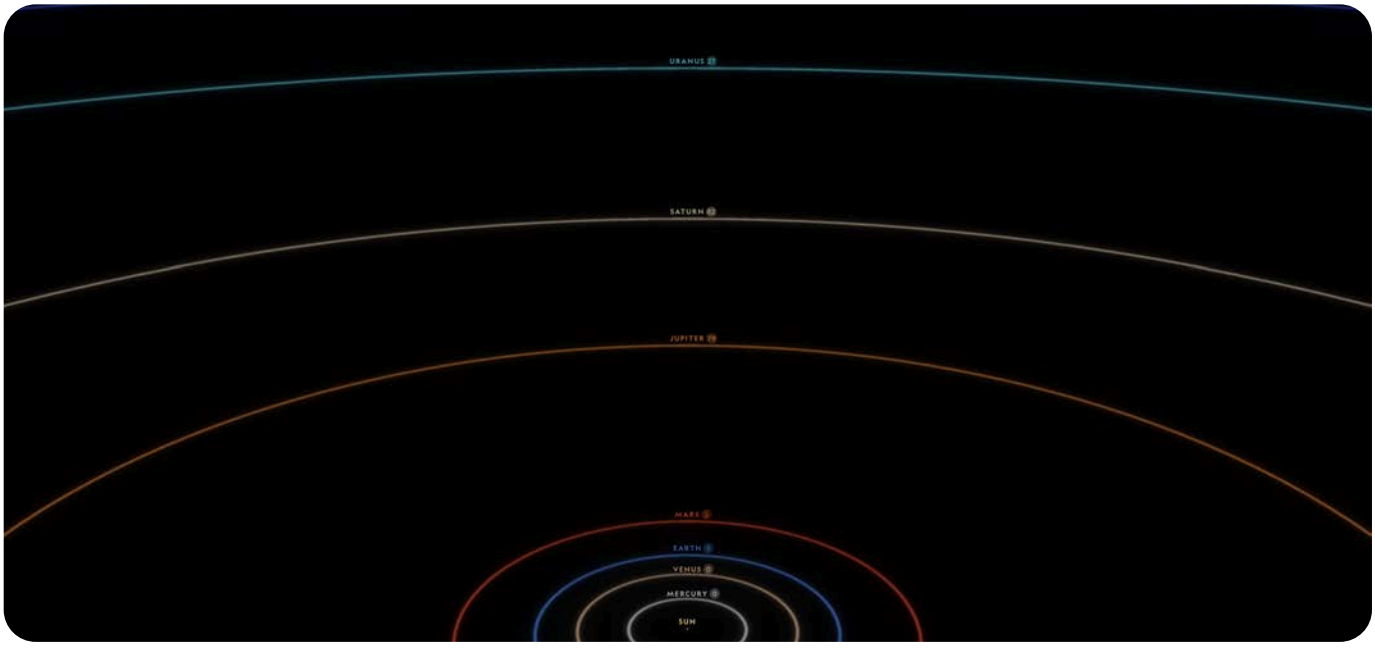
businesses. These giants were able to use data to perfectly tailor-make their services to meet all the users' expectations, and that is why, even though we now know that „if you're not paying for the product, you are the product," it is so hard to ditch them.

But these two data-hungry leaders are by no means the only ones who realized „the power of knowledge." To better point out that data can be a super-effective way of improving services (without making them creepy), we should take a look at Codex Atlanticus.

The Visual Agency, a data visualization group from Italy, has put together a beautiful digital library of Leonardo da Vinci's journals and notebooks. It's not only the largest digital collection of his work to date but also a great example of how suggestive data can be.



Another beautiful example is „Where the Wild Things Glow.” It was a project created for National Geographic by Jonni Walker. Data visualization was used to show how and where bioluminescence is present on the Southeastern coast of Australia.



To close our subjective „Top 3” of data visualizations, we should mention the one published by National Geographic in 2019. The Atlas of Moons is a scrollable digital visualization that takes users on a space journey. The data is all about the moons in our solar system, starting with our very own.

Data are specific. What's beyond it?

Data can be very specific, and to understand them properly, they must be given context. Yet, to grasp a given context, data are not always needed. Sometimes it happens that data has no context, other times the opposite is true, but the important thing is that both data and context can be visualized, benefiting the business.

The right tools to get this job done are logical/conceptual diagrams that collect items and relationships between them and express them by giving each item a 2D position. The relationships are expressed as connections between the items or overlaps between the items. There are BPMN, mind maps, org charts, flowcharts, state charts, relationship diagrams, and UML, to name just a few. These types of visualization are widely known and commonly used in business. Some of them, Business Process Model and Notation (BPMN) or UML, to be specific, are even ISO standards.

This is no coincidence. Visual notation standards such as BPMN or UML are commonly used to describe processes. Although they can be hooked up with data models, they are not data models, which makes their utility very specific, and in-demand in particular areas. Yet, they are not the answer to all modern challenges due to their generality and complexity. These ready-made notations, although robust, have limitations when tailoring them to business needs, and so are often abandoned in favor of more agile solutions. Simply put, It is not always necessary to use the entire BPMN notation to visualize one simple process taking place in a company.

Still, the visualization of processes has become crucial in business even more than data visualization itself. Some tools enable creating diagrams, such as Visio or Visual Paradigm, but their utility is very generic. They only allow drawing diagrams but don’t provide any way of integrating them with business logic or even business-specific data.

To visualize processes in a way that will be useful for your business, they need to reflect what happens in your and only your business. Data integration or to use the broader term business logic is a must, and here is where GoJS steps in.

What is GoJS?

GoJS is a tool dedicated to building diagrams and graphs. With GoJS it is possible to build almost every type of diagram or chart, from very basic charts, to highly specific industrial diagrams, SCADA systems, BPMN diagrams, medical genograms, modeling diagrams, and many others.

GoJS is

- a feature-rich, extensible and flexible JavaScript and Type-Script library. It provides a set of ready-to-use functions, custo-mizable templates, and layouts that makes life easy for deve-lopers while ensuring a high degree of customization.

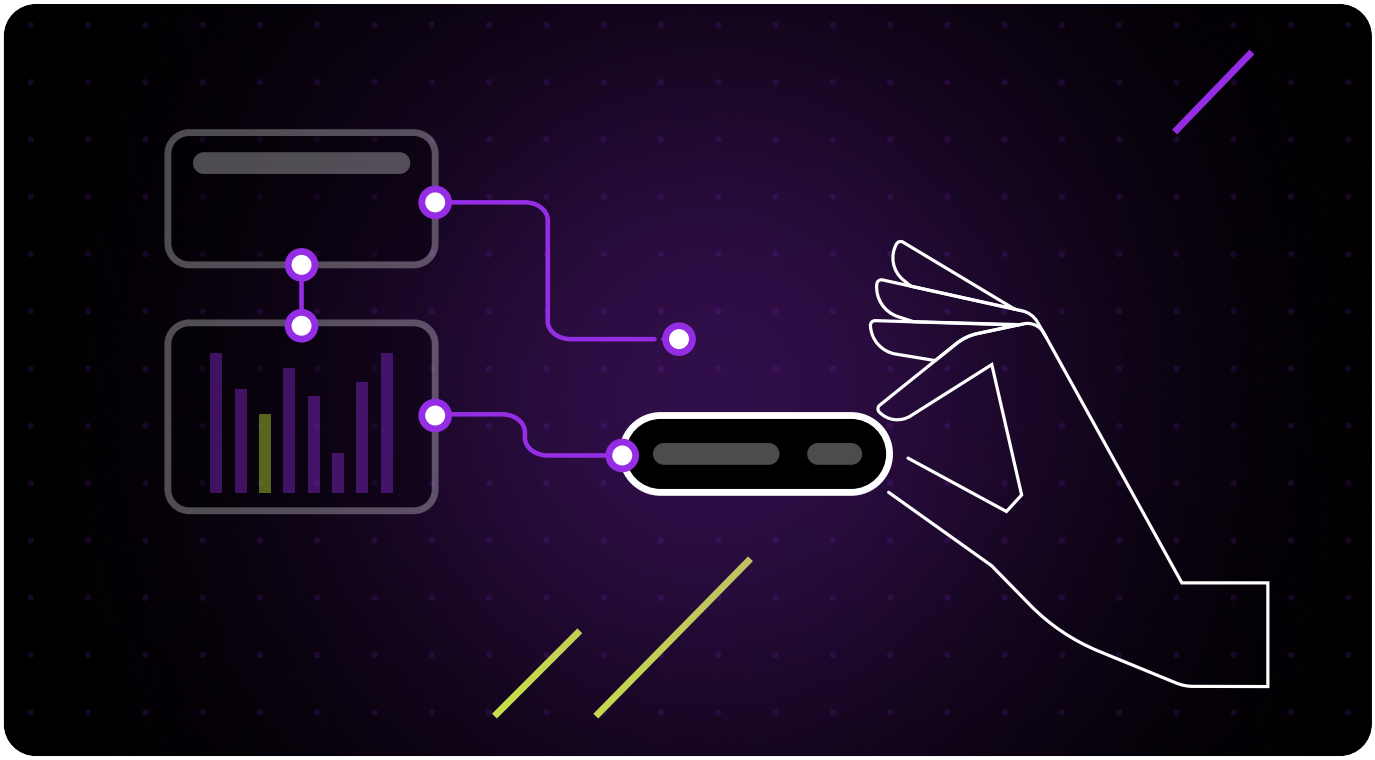
GoJS is NOT

- a ready-to-use visual editor with a fixed number of features;
- a framework that arbitrarily implies the way the app must be written.

To use GoJS, however, certain technical skills are crucial, and in the case of the most advanced apps dedicated to non-technical end-users, it must be enhanced by a professional UX Designer. However, thanks to it’s robust set of given functions, the amount of time needed to build an app using GoJS can be significantly reduced.

GoJS, out-of-the-box, offers support for interactivity, providing features such as drag&drop, copy&paste, context menus, in-place text editing, tooltips, automatic layouts, templates, data binding, and models, palettes, event handlers, and commands, to name just a few. To put it simply, it allows you to create fully editable diagrams.

However, betting on JavaScript application or library may be surprising to those who recall what this language was like a decade ago. And two decades ago, the statement that it is a language for „boys," not „men," was embarrassingly popular. Meanwhile, JavaScript has grown into one of the world's most promising and most in-demand programming languages thanks to its flexibility, scalability, and relatively flat learning curve.



The skyrocketing popularity of JavaScript has triggered an avalanche of libraries and frameworks build around this language. Today, JavaScript-related technologies are so plentiful that the never-ending quest „to find the right solution" provokes endless debate and rarely finds an unambiguous conclusion.

Although the fiercest competition is between the „Holy Trinity” of Angular, React, and Vue.js, which have recently taken the lead, there are plenty more niche solutions that are being developed away from the spotlight.

GoJS is one of them. Due to being diagram-oriented, it can’t be seen as a competitor to the more universal „Holy Trinity.” Still, GoJS, just like Angular, React and Vue.js arose from the growing popularity of JavaScript.

GoJS was launched in 2012 by Northwoods Software, a tech company focused on providing superior graphical user interfaces. Northwoods’ engineers found a niche on the market for interactive diagram components and class libraries across a variety of platforms and decided to fill it.

Over the years, Northwoods Software has established itself as one of the most reliable providers of advanced, interactive business diagrams.

The company specializes in well-designed libraries with their main goal being to shorten projects' time to market and to make developers' work easier. Northwoods offers strong developer-to-developer support by providing free consultations during trials and expanded tutorials online to help get projects started right away.

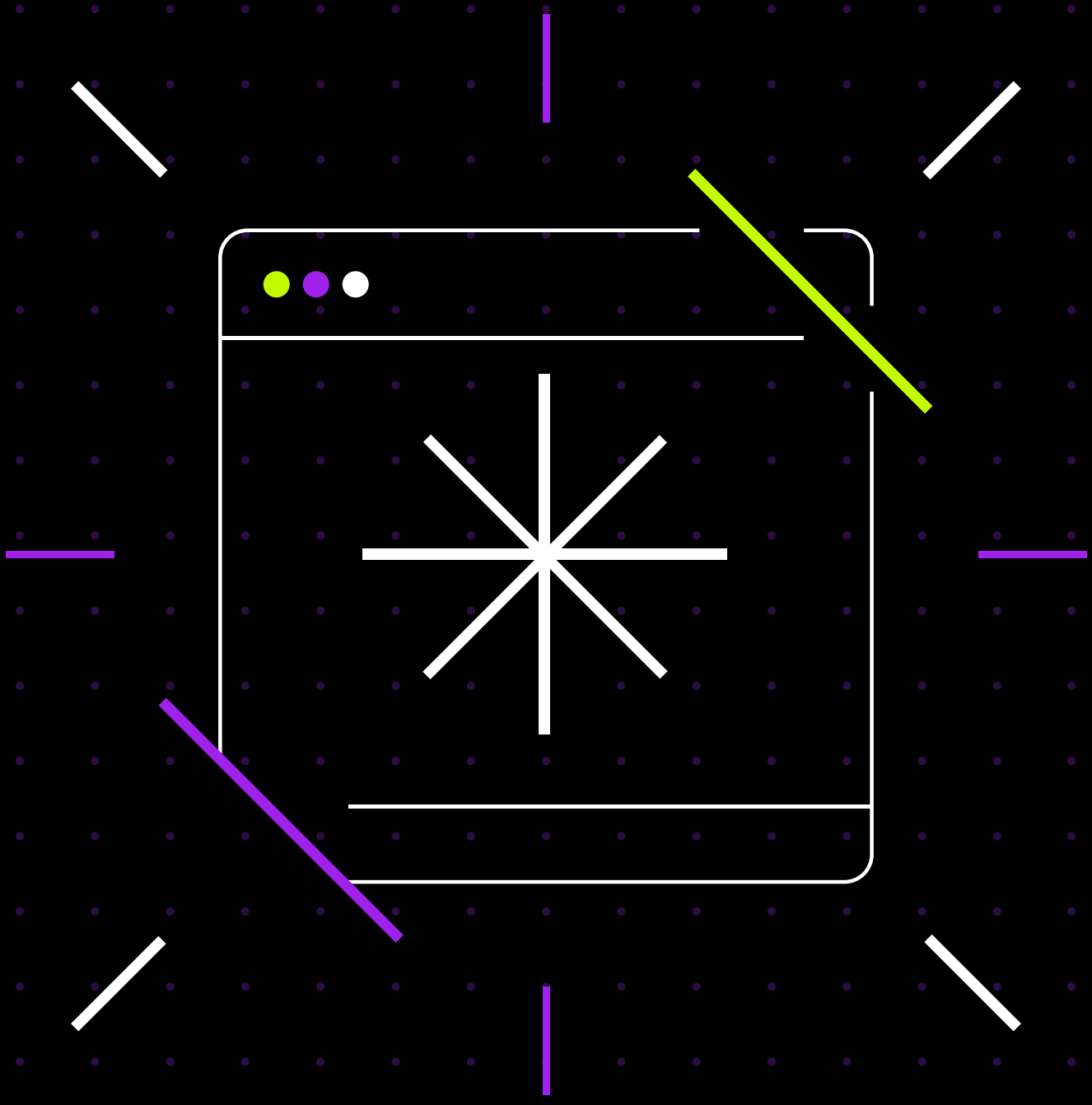
Thanks to its pro-consumer approach, hundreds of sample applications, demonstrating different kinds of solutions, and differentiated pricing options, Northwoods is appreciated by both promising startups and Fortune 100-listed companies.

GoJS, created by developers for developers, quickly gained popularity as one of the most trustworthy solutions, and as the need for data visualization tools continues to grow its adoption only increased.

> **Anytime we have a customer that requires full development services involving GoJS, we recommend the Synergy Codes team**

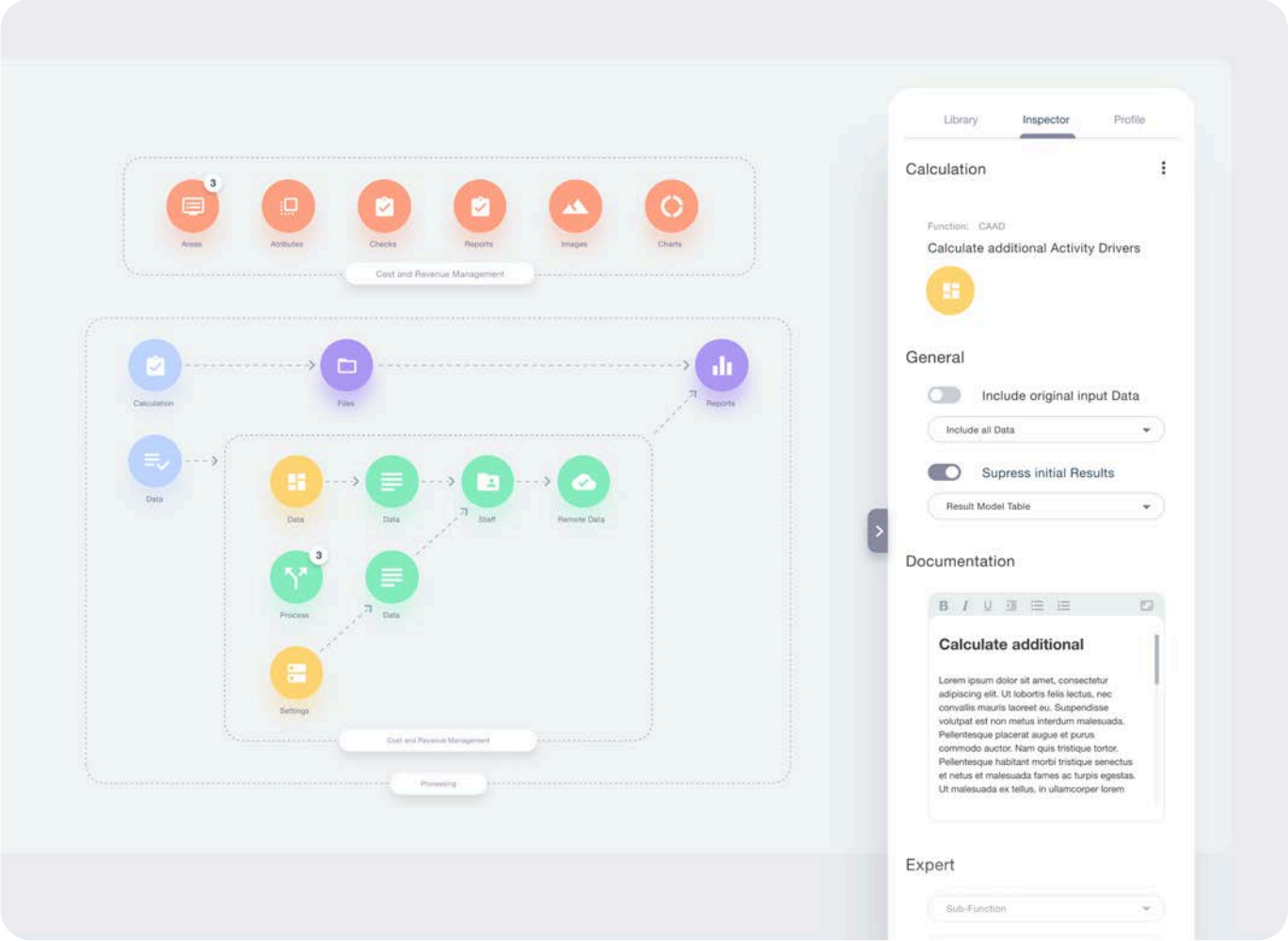
Jason Stewart
Vice President of Sales, Northwoods Software, the owner of GoJS library

2 Business Benefits



Business benefits of GoJS-based data visualizations

From the most general point of view, data visualization is a tool which simplifies working with data by displaying them in a reada-ble, graphical form. However, the particular value of GoJS, which is focused as much on data as on relations between them, requires a more in-depth explanation. Let's dive deeper into the topic.



Processes, in general, may be seen as conditional sentences, as they consist of stable elements (nouns) and actions that need to be taken to move things forward (verbs) after the occurrence of a pre-defined trigger. Let's agree that these nouns and verbs are various types of data that combine in many ways. It is relatively easy to translate them into graphical forms that can be presented, measured or compared.

And here is where GoJS shines, by showing such data in one flow, emphasizing all relations between them. It is dedicated to building graphs and diagrams. What are the differences between charts done with editors such as Tableau and GoJS? There are no hard and fast rules here, but roughly speaking diagrams are focused on correlations between particular elements in time or space. Diagrams can show dynamics, illustrate dependencies and present them in a cause-effect sequence. Long story short: they can show how something works. Charts, on the other hand, are focused primarily on quantitative data presentation.

How can it benefit your business?

First, it surely can, as the human brain interprets visual forms way better and much easier than linear numerical or textual information. Finding patterns and then making the right decision based on a line of numbers embodied in a flat Excel-like table is extremely hard and makes coming to a quick decision almost impossible.

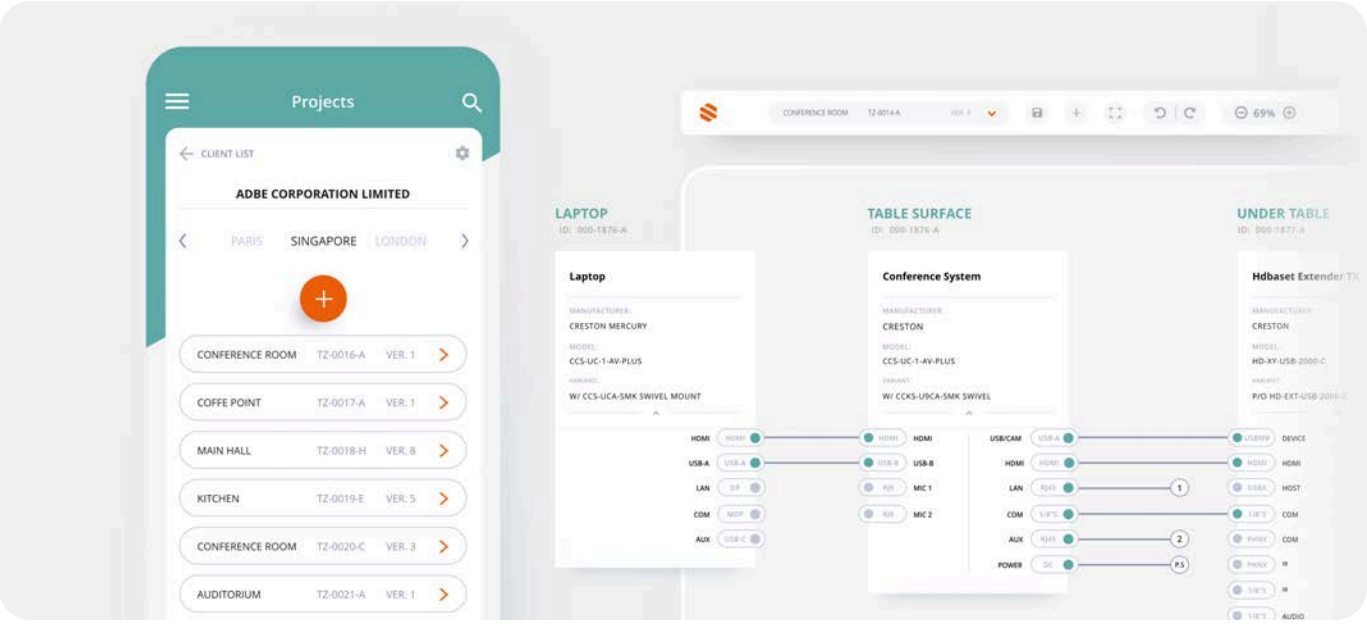
And that is a problem because it is no exaggeration to say that quick action is the only way to capture customers' attention and meet or, even better, exceed their expectations.

The statement „time is money” no matter how corny it sounds was never truer than now, in the digital era, when customers expect personalized services delivered at lightning-fast speed. The longer the decision making process lasts providing the necessary information, preparing offers, crafting customized products the more money is „burnt” both by the sales team and product engineers. Not to mention that clients forced to wait for answers are always more willing to change their minds and withdraw their intention to purchase.

The general benefits of data visualization

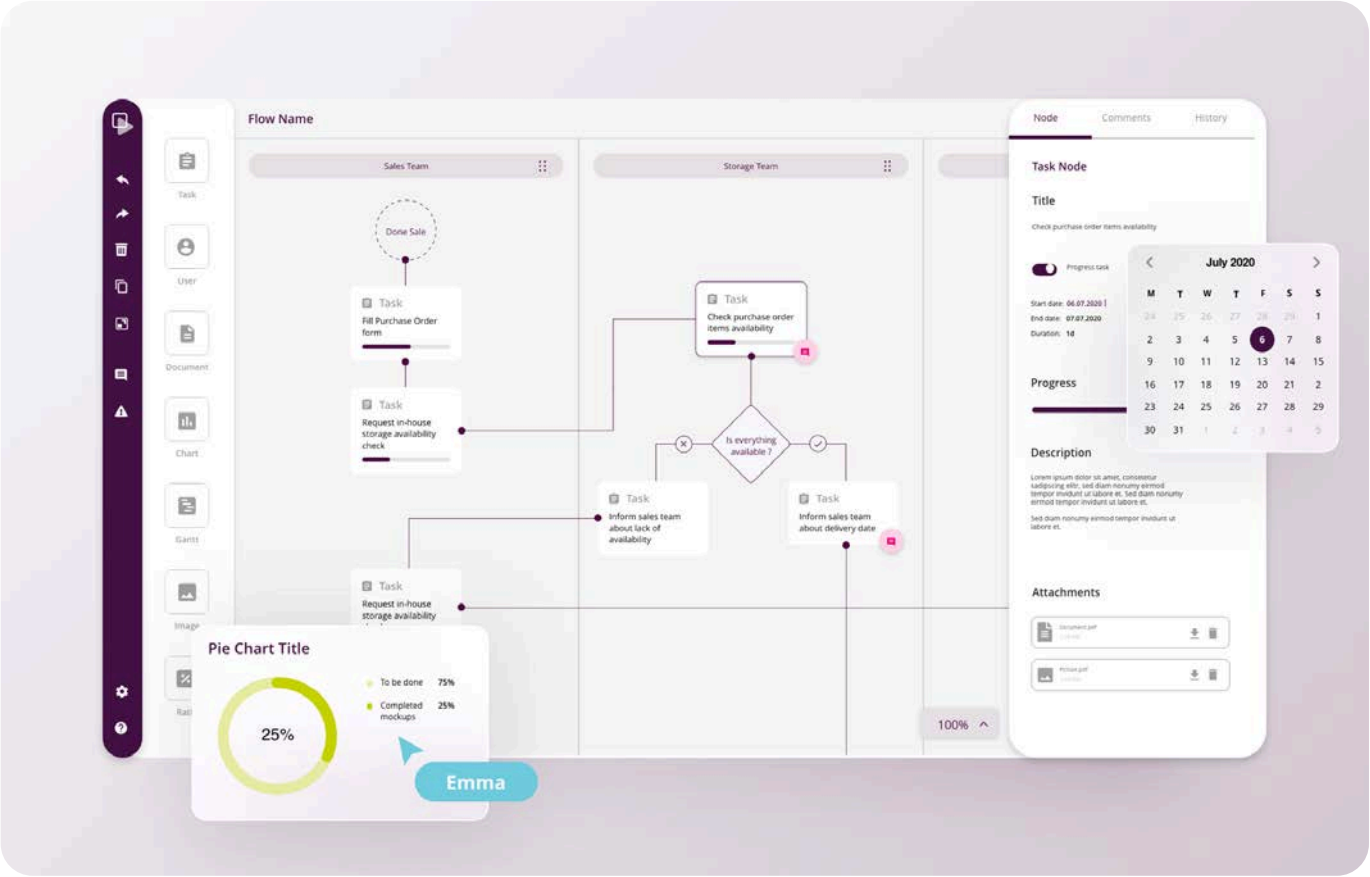
Saving time is the most crucial but also most general benefit of data visualization, so let’s explore the issue further:

Quick action
Data visualizations allow decision-makers to monitor ongoing processes and thanks to their visual form make it easy to notice (and so prevent) possible issues.



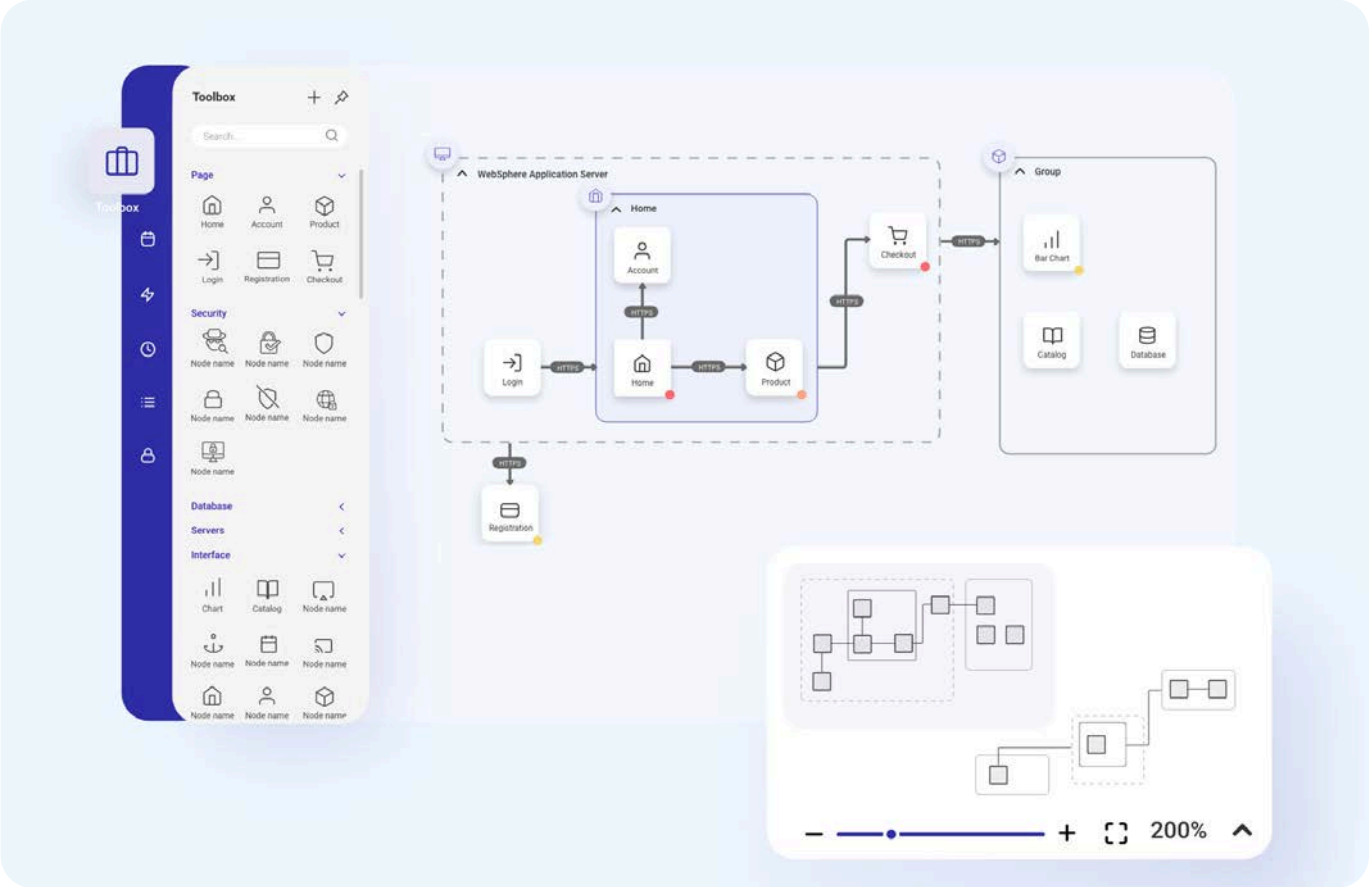
Better analysis

Data visualizations allow decision-makers to monitor ongoing processes and make it easy to notice eventual issues or remove bottlenecks. For example, it is possible to mark what stage of a process an employee is currently at, or connect a chosen stage of a process with a specific set of data (even the note „done” can be seen as data, when used with a Kanban board, for example). This way, the diagram gives instant access to hard data.



Avoiding errors

Visualizing data prevents employees from making errors by allowing them to put every action that needs to be taken into a readable scheme of Kanban boards or decision trees. A Kanban board depicts work processes by representing their particular stages and items. Decision trees showcase decision sequences with their possible consequences. They can include numerous variables, including the chance of event outcomes, costs, time, and many others.

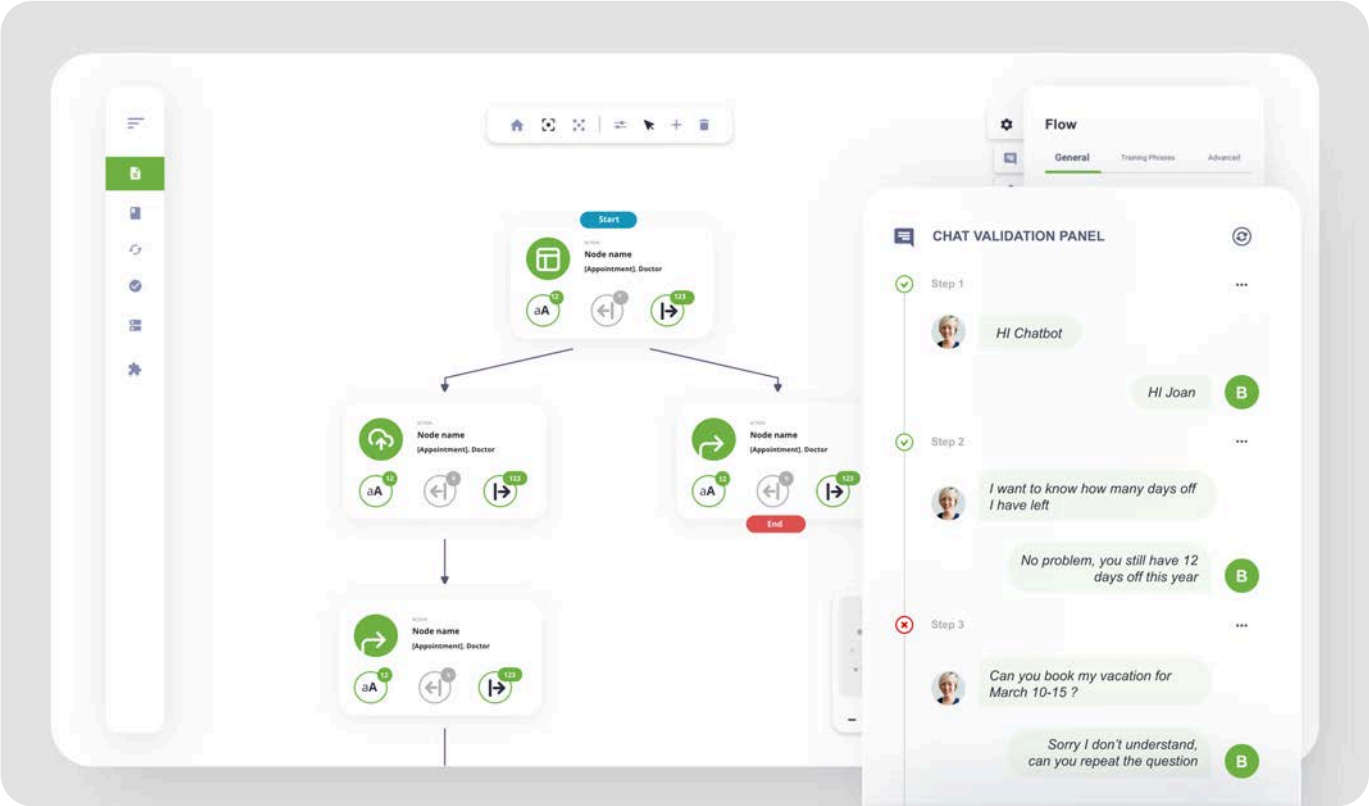


Track results

Visual representation of data can be used to monitor progress in terms of any given goals such as KPI, revenue, closed deals, leads, and the status of deal stages in the sales funnel.

Enhance communications

Data visualization particularly BPMN provides every team with insight into graphically-depicted processes that must occur, which is one way of smoothing out mutual, cross-department communications.



Real-life examples of how data visualization improves processes

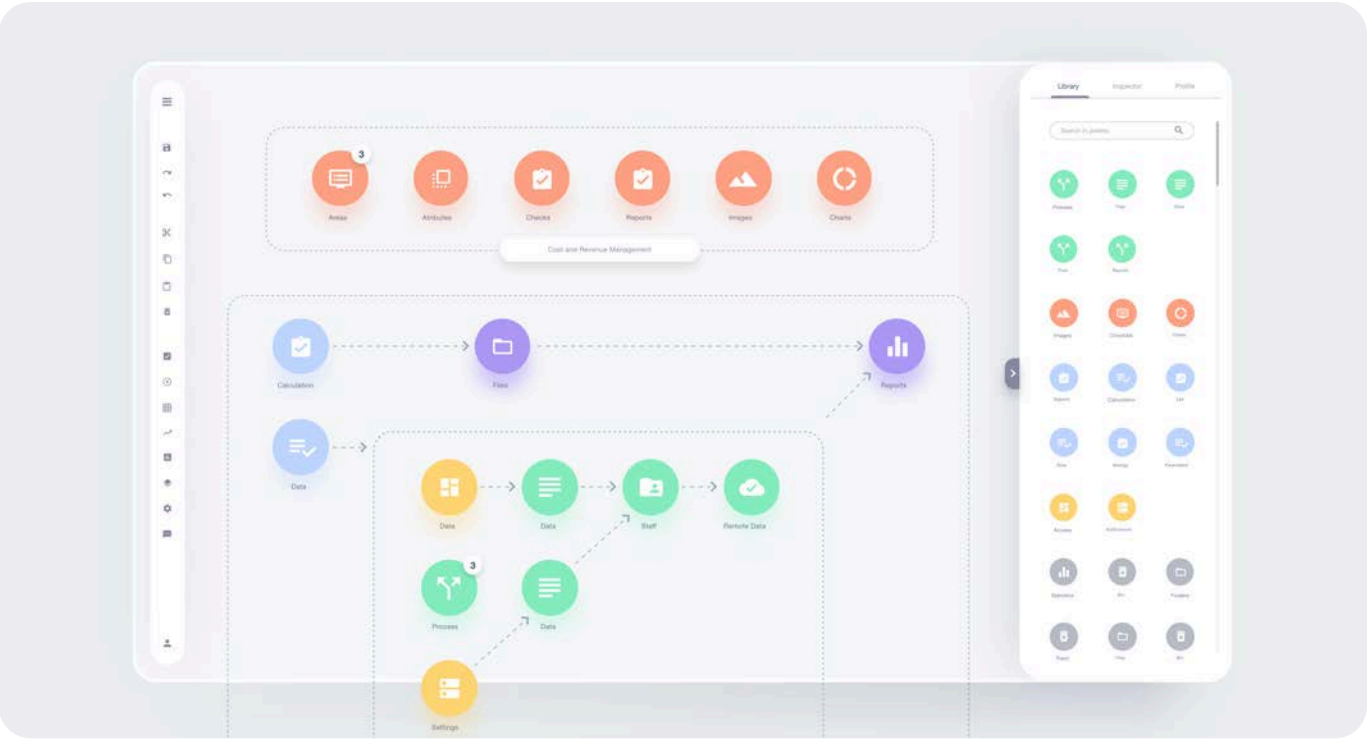
The advantages mentioned above can be multiplied, as every organization may find its own unique way of using data circulation. However, to help give you a more concrete idea of how that may look, we have presented you with a few real-life use cases below.

Business Process Modeling & Data Flow Management

A similar idea with a different utilization uses GoJS apps in business process modeling. BPM, in general, is the graphical representation of workflows within an organization. It allows pinpointing bottlenecks and aims to streamline processes.

Thanks to GoJS, with its interactive support and graphical user interface, it is easy to create an app encompassing all the cross-department processes within a company. It can lead to, for example, more effective usage of data circulating within the company. Typically, data are stored in separate silos, and are therefore difficult to interpret. By implementing data flow management in the form of a GoJS app, employees can:

- access any data set;
- perform any action on them (for example sorting them and combining them into new sets);
- transfer any new data sets to the department that needs them.

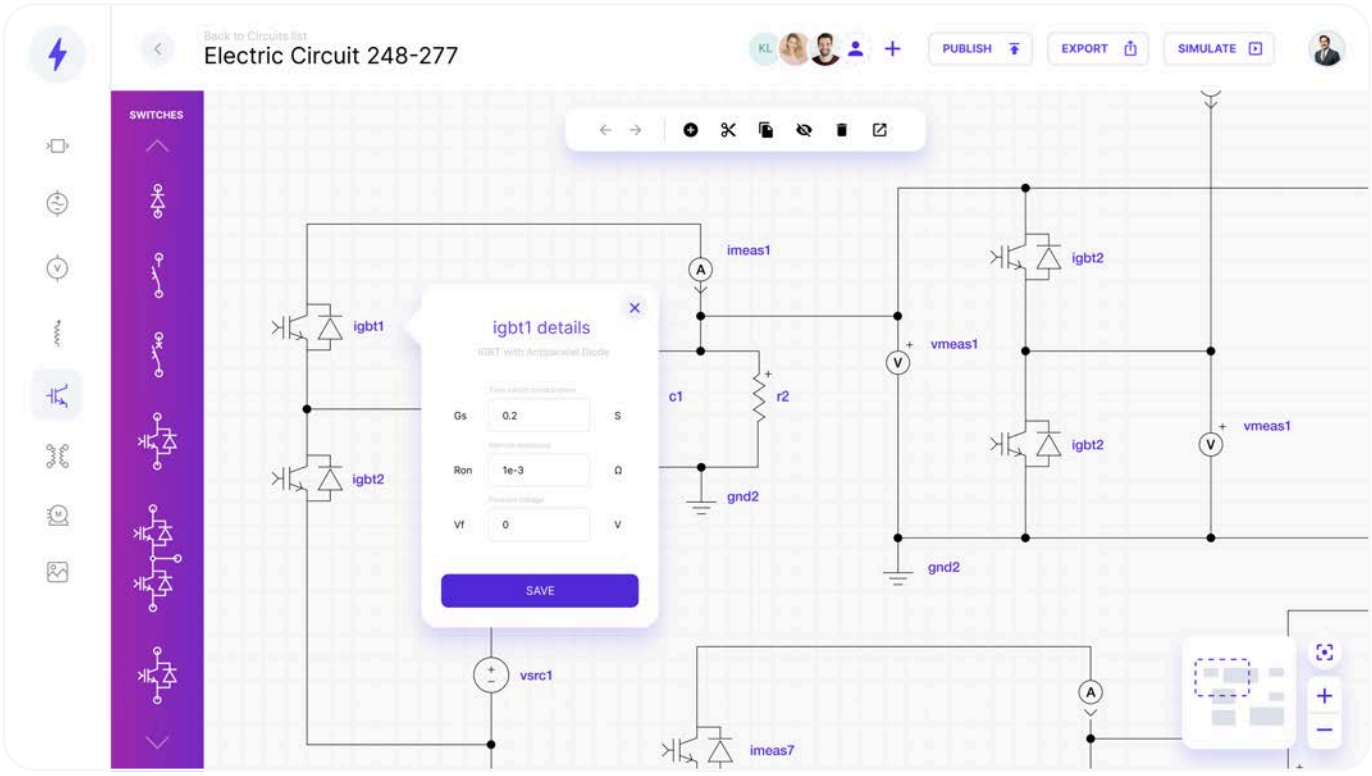


This way, all departments can work on consistent and up-to-date inputs and use them to create any necessary reports (e.g., financial, legal, sales, etc.). And it doesn't have to be overwhelming, as it is possible to assign particular views to teams responsible for executing specific tasks.

This way, GoJS gives an overview of important processes and supports their realization, no matter if we are talking about tracking and managing data, documents, money flow, or even bioinformatic processes involving particular stages of DNA sample testing.

Schematic Design

More proof of GoJS' diagramming capabilities lies in the area of schematic design. The primary purpose of schematic design is to accurately map physical reality into graphical form, taking into account all physical requirements and the relationships between them.



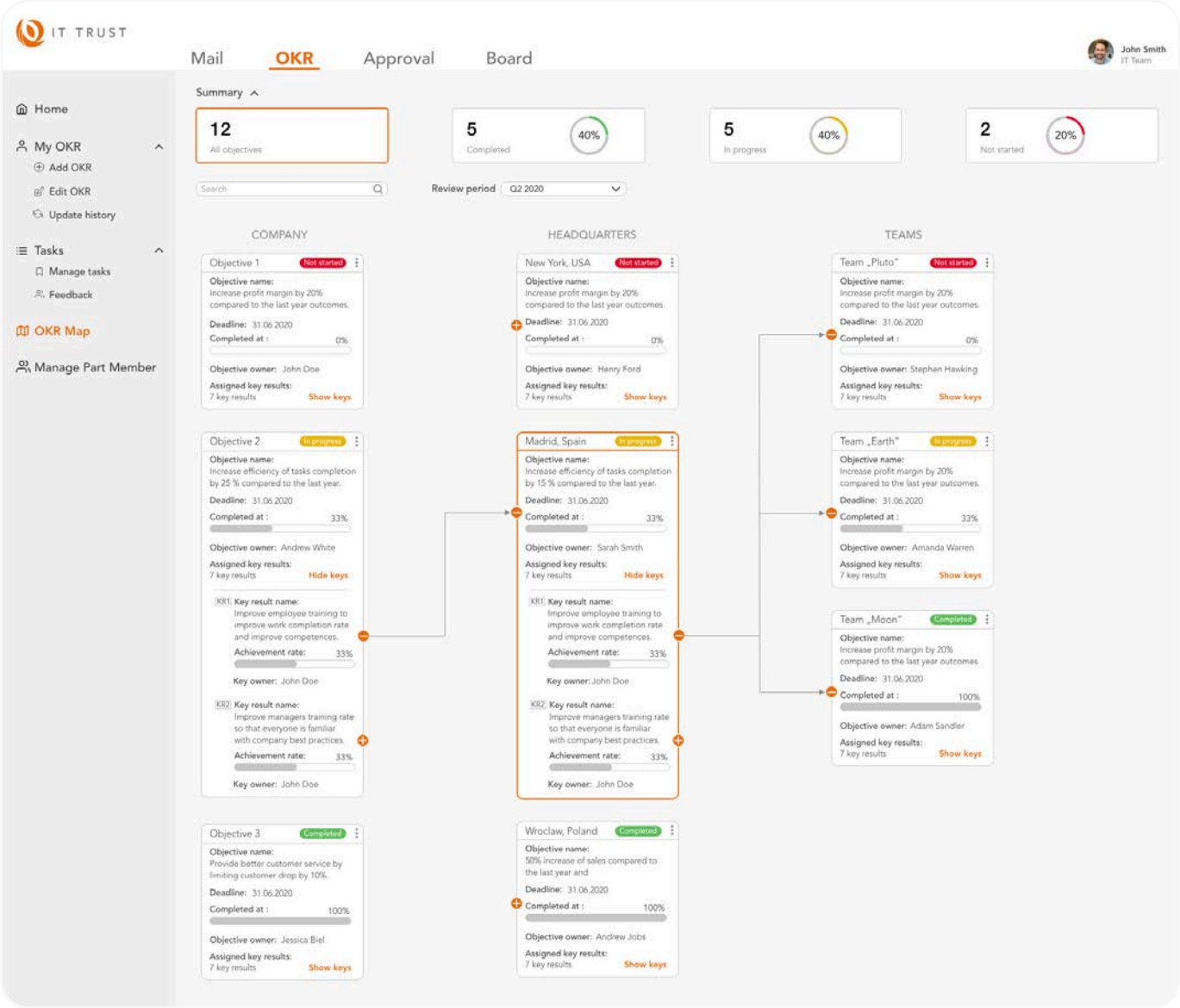
The schematic design in GoJS includes a description of structural, mechanical, plumbing, and electrical building systems, to name just a few, and enables the implementation of risk strategies relating to security, flooding, or fire alarms. By defining the technical aspects of every stable element of the system and grasping all their implications, schematic designs allow depicting the process that must be run in case of any unexpected event.

To make it clearer, let's jump into an example involving the plumbing system in a given building. Every plumbing system consists of the same elements. Yet, its configuration and the materials used are very different, making every system unique. Schematic designs, by defining technical aspects such as pipe material, can depict what temperature the material melts at, what its fluid flow is, what kind of liquid can flow through it, and so on. Moreover, schematic design maps in the GoJS app can be endlessly versioned to keep them accurate and up-to-date. There is no limitation to adding and removing nodes (elements) and complicating the logic describing the relations between them. the logic describing relations between them.

Structures (Org Charts)

As much as GoJS focuses on, and excels at depicting data flow, it can also be used to describe some structures, such as companies' org charts or OKR maps.

GoJS diagrams can take into account each employee's level in the hierarchy and the relationship between them. Using the drag & drop features allows users to change these relationships and enable them to add (and remove) nodes, which ensures the ability to reflect any recent changes, making it useful as a support tool for HR departments.

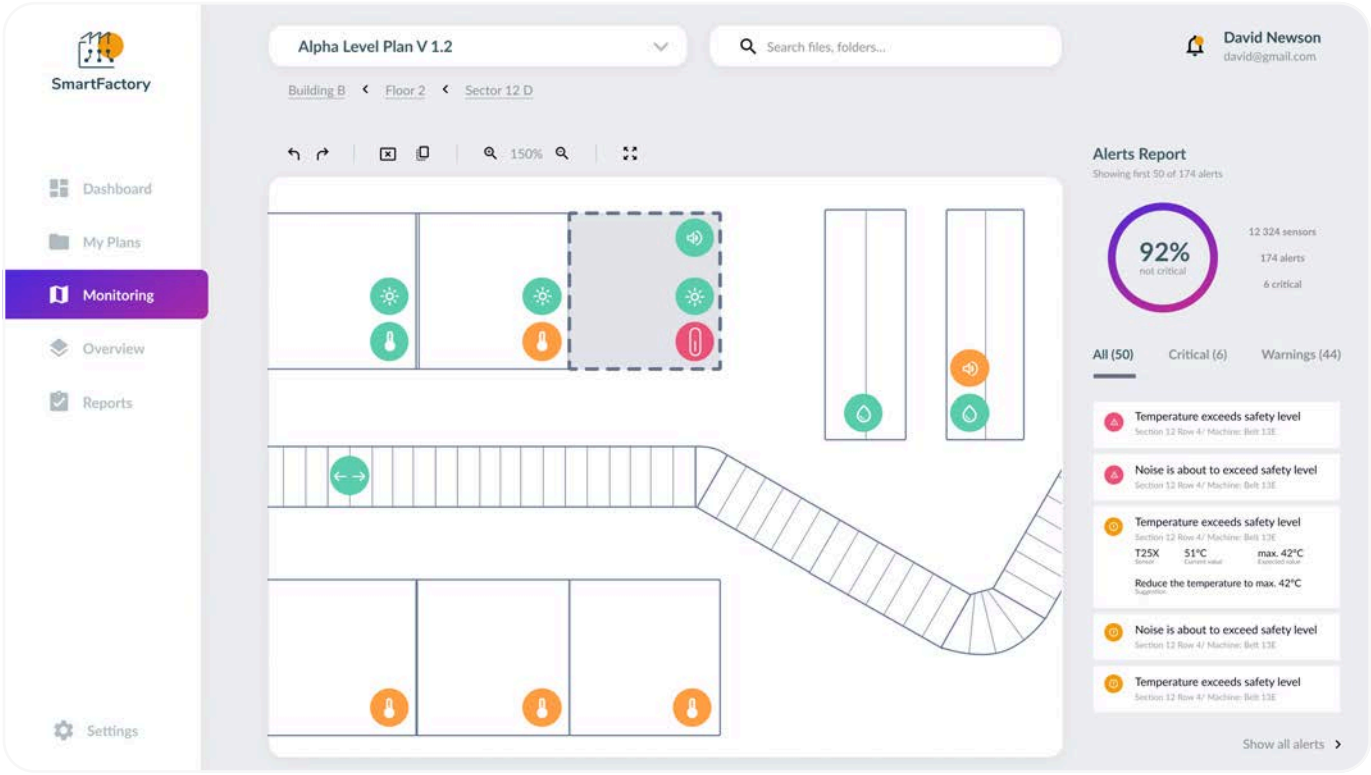


Monitoring system

Configurators are not the only thing that GoJS offers (see below). This library can also be used to build systems enabling administrators to monitor a variety of sensors in, e.g., industrial halls. Their range and level of complexity may vary from small apps including tens of elements to advanced solutions that encompass a company's entire infrastructure consisting of thousands of sensors.

It is easy and error-proof to monitor and control heating, ventilation, air conditioning systems access, energy consumption, and many other variables. Moreover, sensors can automatically generate warnings in case of any problems. The particular way of configuring the app can be set freely and adjusted to meet individual needs. The user defines which elements should be monitored and which usage levels should trigger a warning displayed in an easy-to-understand visual form.

The whole concept of monitoring systems based on GoJS, although its usage is very different, remains basically the same: it's about ease of use. Although defining the business logic requires technical skills, using the app thanks to its graphical user interface is designed with non-technical workers in mind.

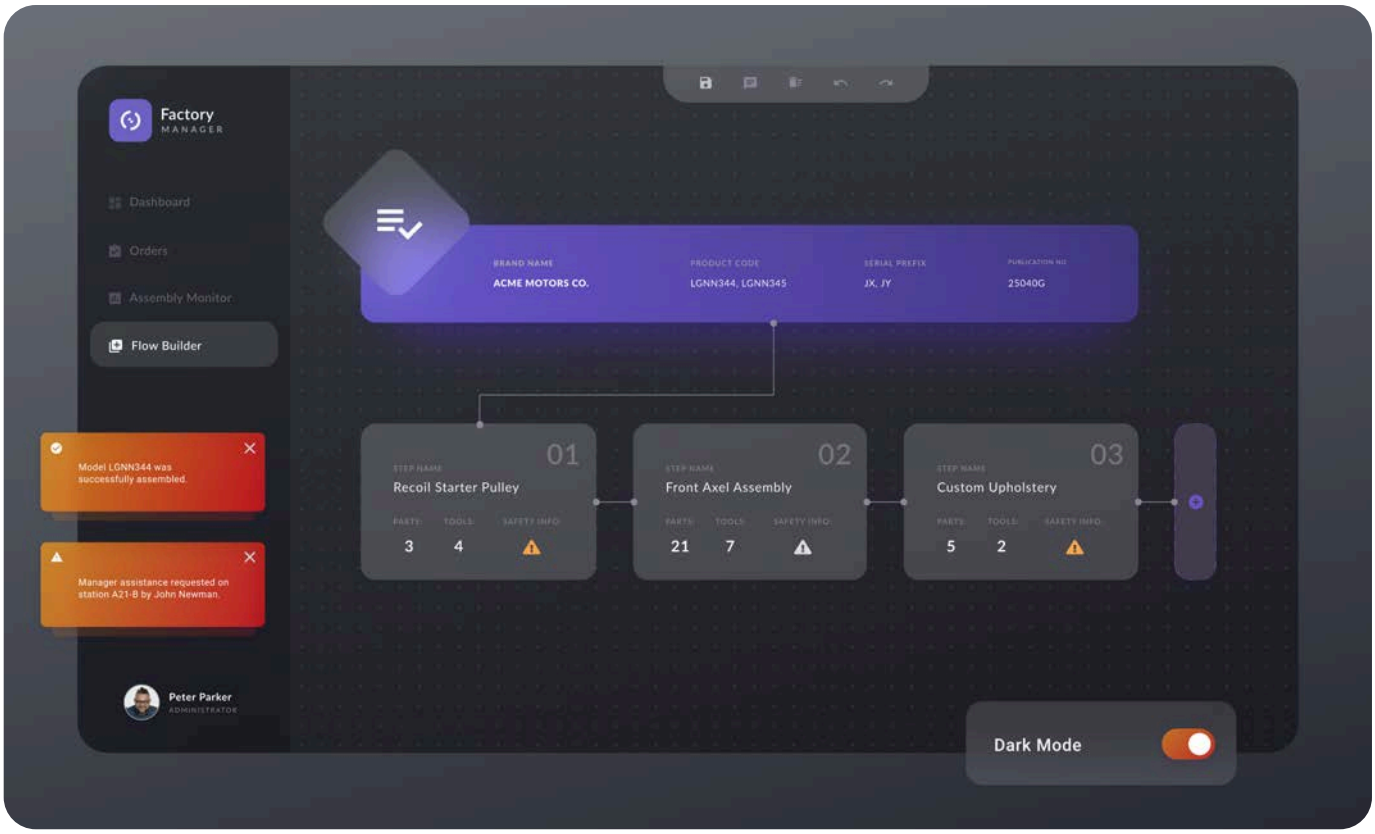


Product Configuration

From rising start-ups to household names, businesses must offer personalized product options to meet customers' expectations whose main desire is to stand out. The „customization race" has already started, and more and more companies are jumping on the bandwagon. Some of them make customization the center of their business model, while others add this feature as an option to extend their product lines or services.

How do product configurators work?

The development of customized products and services requires tools that give customers control. It must be based on technology that facilita-tes the design and manufacture of customized products, and its ease of use is a crucial success factor.



Fortunately, GoJS, by default, meets the challenge.

Thanks to full support for interactivity „baked into” this JS library (embodied in features such as drag&drop, undo/redo, or clipboard layout, to name just a few), navigating GoJS-based tools is as intuitive as could be.

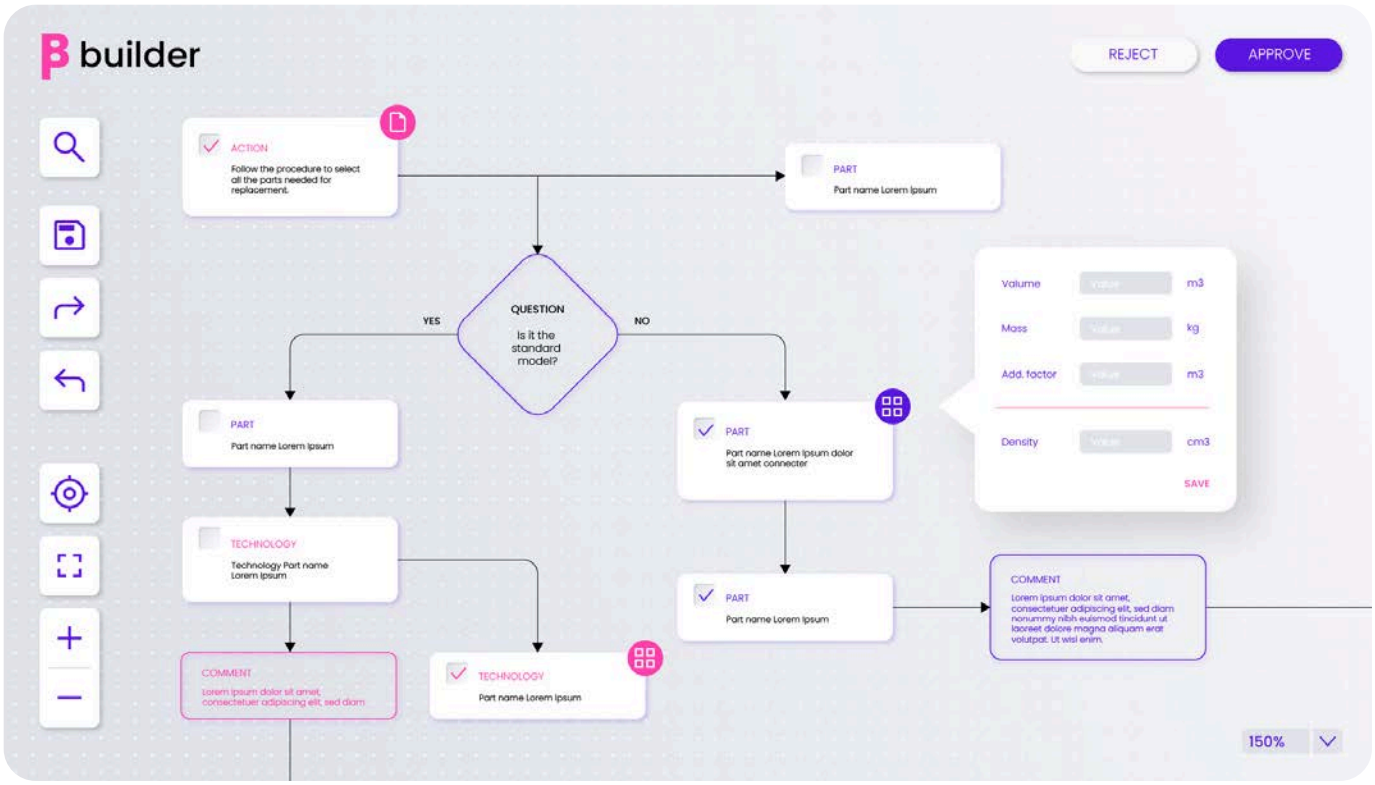
End-user can freely edit a diagram, and, by dragging the elements, compose the desired item, and immediately know the final price of the product.

Using templates allows users to take control of the design process and simultaneously reduces the risk of making mistakes. The number of rules that can be written into the app business logic is limitless.

These kinds of visual configurators can be used to design both physical and digital end products, services, and/or particular elements of advanced industry-level solutions. The only thing that differs is the logic, which can be defined freely to increase sales, boost consumer engagement and improve internal manufacturing processes.

One of the best examples of using GoJS this way is the automotive industry. It is a very specific industry compared to others. Here is why:

- Vehicles are used under considerably varying conditions implied by local legal systems
- Components are reused within many vehicle models, and so they have to be compatible with embedded systems, but they must also adapt to specific requirements
- Automotive workflows are extremely complex, included multi-tiered suppliers, engineers, and controllers operating worldwide
- The industry is highly safety-sensitive, an advanced system of control of any non-standard actions prevents making costly mistakes.



While developing a product configuration tool for the automotive industry, we concluded that we have to think of it as a safe space for engineers.

To make that happen, we focused on providing clients with an app that allows them to define a process by composing it from objects (items and actions) approved as safe and aligned with internal policy. The tool covers all possible decisions that must be made due to local legal requirements, type of vehicle, logistic limitations, and so on. Knowing that it cannot always be binary choices, the processes had to enable taking „non-standard" actions. Yet, all „non-standard" actions increase the risk of costly mistakes. Therefore, some form of "safety fuses" had to be implemented. That's why choosing any non-standard object entails the necessity of explaining that decision and requires going through some additional control. Only after approval can the process continue.

By making users' choices safe, and without looking over the shoulder of the supervisor, the entire company can respond to changes quickly, which is essential in today's hyper-paced business environment, from

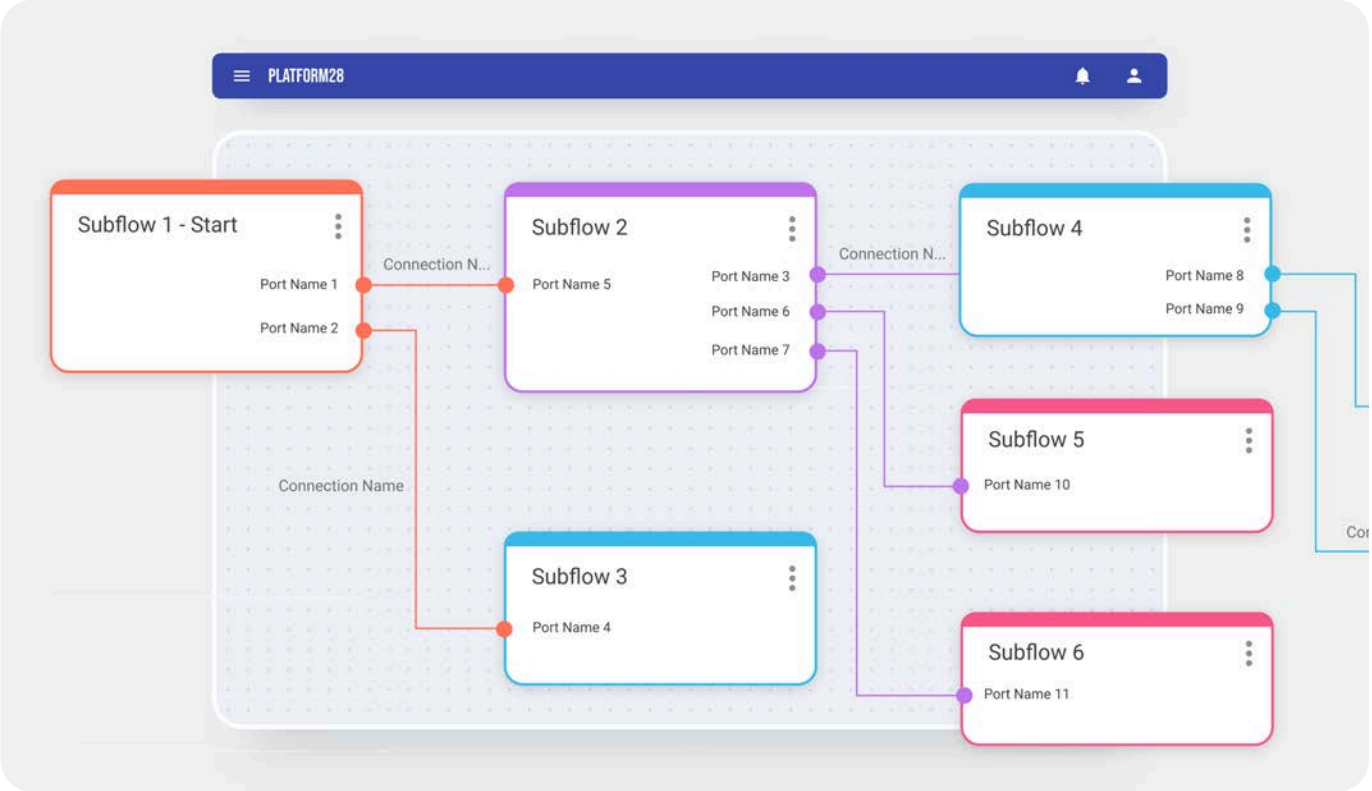
which the automotive industry is not an exception. Such an approach makes it easy to scale the business and onboard new employees knowledge of how things must be done is no longer top-secret.

Robotic Process Automation

Business processes and pretty much every business activity which can be „broken down" into a sequence of processes consist of both repeatable tasks and the so-called „human touch". Typically, the problem is that repeatable tasks consume a vast amount of time, reducing the space for human creativity. Reversing this situation is highly desirable, and this is precisely how GoJS apps can be used.

The idea of Robotic Process Automation aims to help employees get repetitive tasks done faster and more smoothly. It can be used in numerous areas, for example:

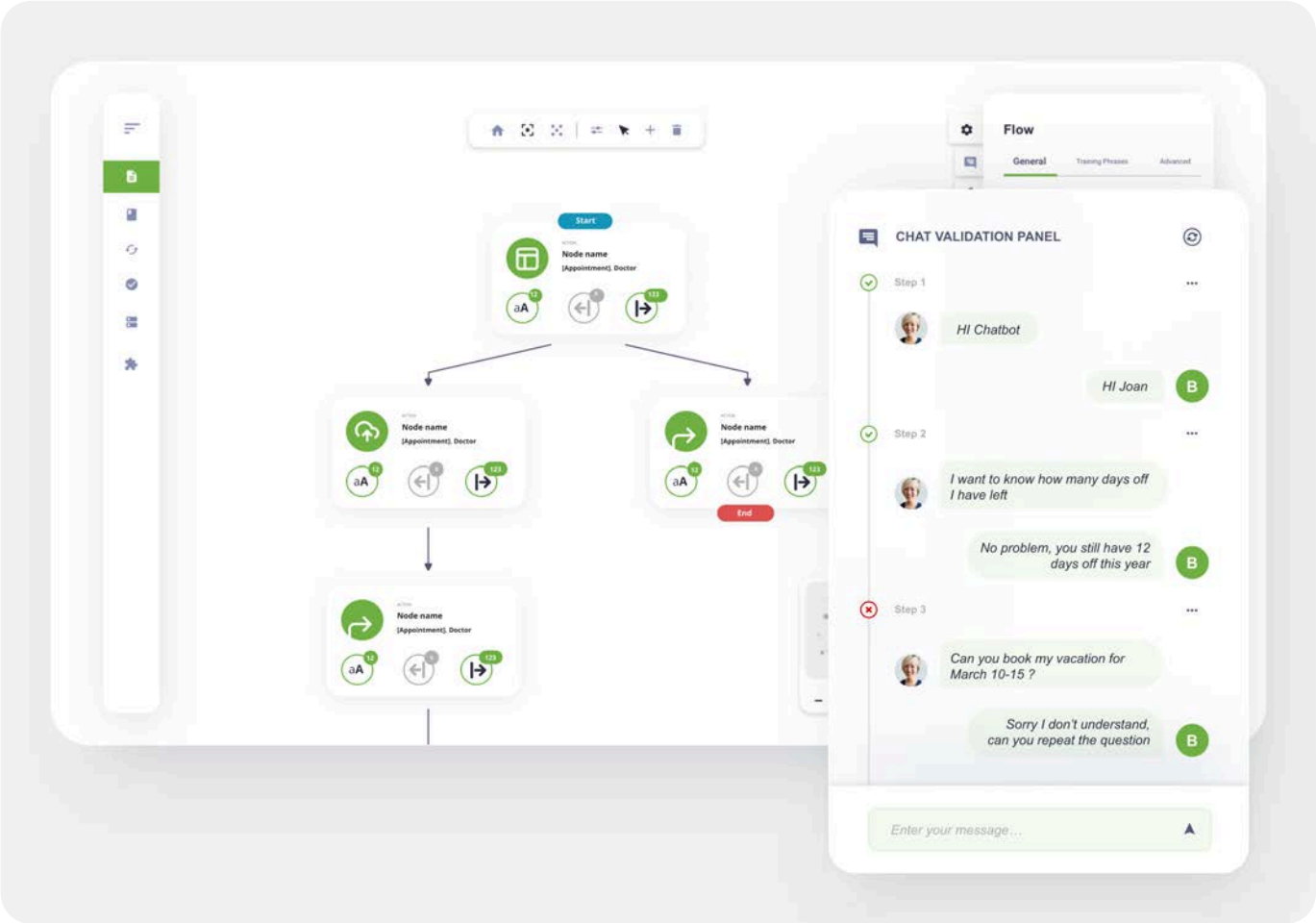
- **Customer Service**
  Automated customer service can sort queries and offer customers initial responses, segregate them and send them into different categories, such as the tech department, service department, etc.
- **Document Processing (invoices, payrolls)**
  RPA can speed up data input, reduce the number of repetitive tasks, and avoid inaccuracies and delays.
- **Order processing**
  Sales data must be input into the sales team's system and then proceeded by the finance or/and legal department. The flow requires them to be consistent, and manually processing such data leaves room for misunderstandings. Automatization helps to solve that problem.



How does it work in practice? To showcase the possibilities of GoJS, we can use some chatbot examples, with a disclaimer that it is by no means all RPA can do.

Chatbots, however, are quite a good illustration of how customer service can be smoothed out using RPA. By providing an easy-to-follow graphically-depicted scenario of repetitive conversations with clients, Chatbots remove the necessity of collecting information manually and transferring them between departments. They save on human labor, enabling employees to use that time to work directly with clients whose needs involve non-typical issues.

Another type of automation is the sorting of incoming facility management invoices. The robot can be responsible for analyzing them, as-signing them to a particular group (e.g., electricity, water, heating bills, vendor repairs, procurement), and placing them in the AP queue by date. All steps of analysis as well as a whole set of rules (such as choosing the date format depending on what country the invoice was issued in) can be applied by a non-technical user via a clear, graphical interface.



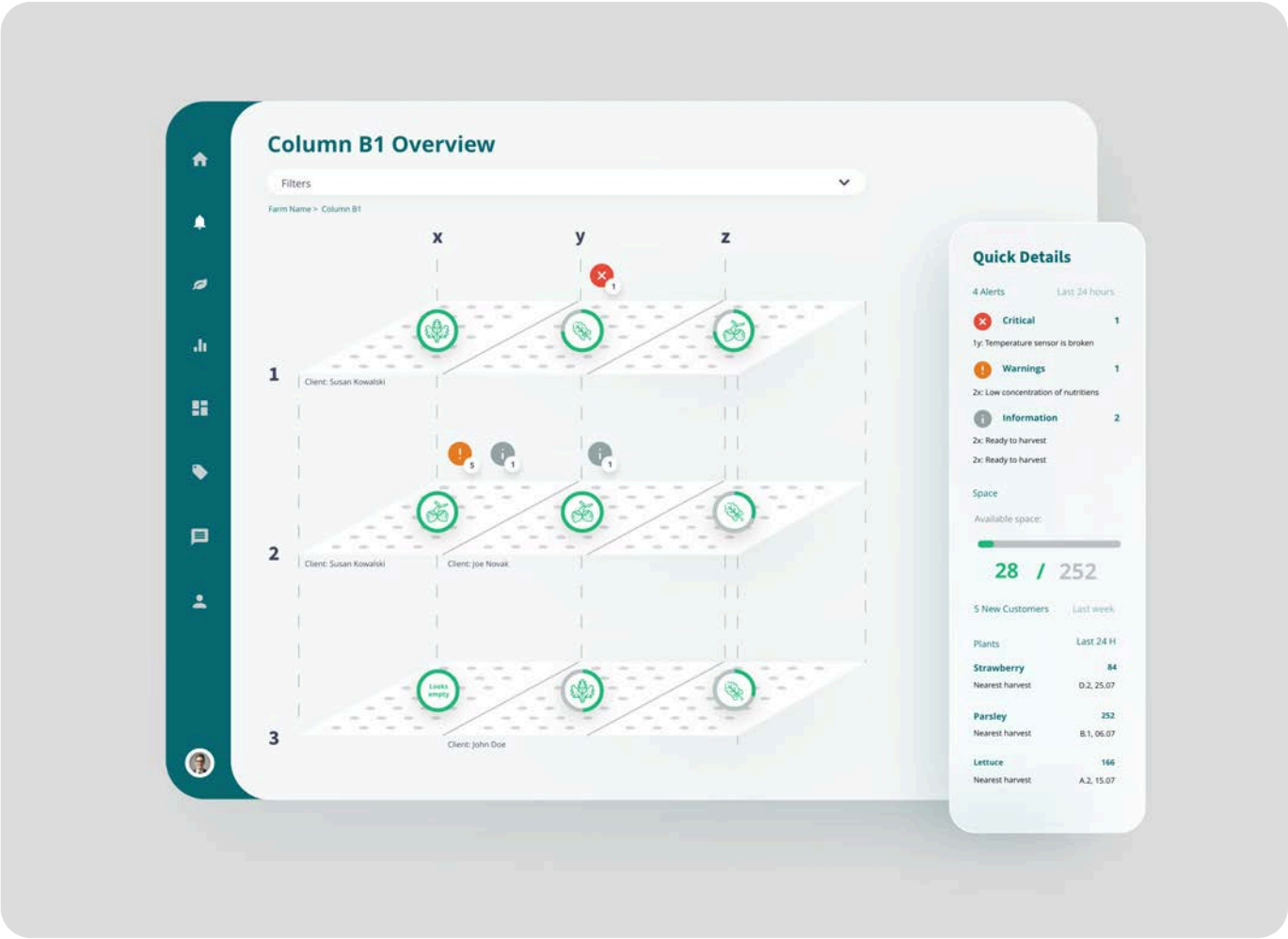
Digital Twin (Simulations)

This mysterious term refers to a virtual simulation model of an „item” (such as a car, airplane, tunnel, building, bridge, engine, or production line), which imitates how the actual „item” behaves or works in real life. It is a tool that helps engineers to foresee how products will perform in given circumstances.

They allow manufacturers and engineers to:

- Test products in real use cases
- Revamp their initial assumptions due to predictive analytics
- Connect data coming from many silos
- Identify and understand the nature of potential faults
- Reduce the risk of putting faulty products into the market.

Digital twins are already commonly used in organizations, especially in those which have to keep up with changing customer preferences. It allows businesses to deliver high-quality products at a fast pace.



Want to know more about GoJS in business?

Let us show you more apps made with GoJS, explain how it works and give you a hands-on experience of how GoJS can be used to grow your business.

Maciej Teska
CEO at Synergy Codes

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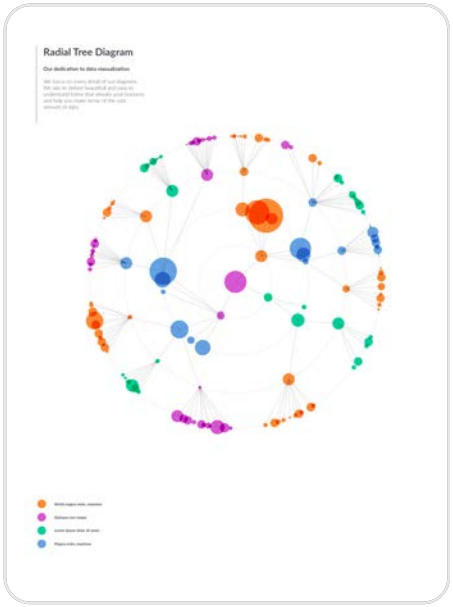
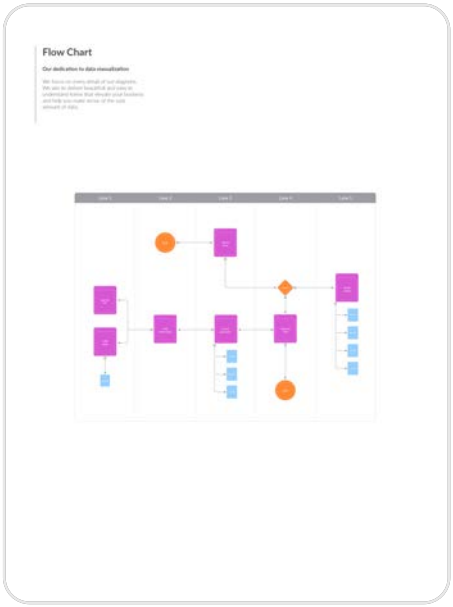
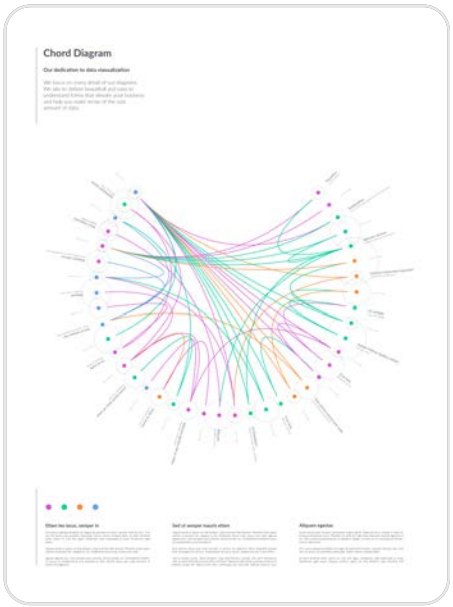
3 Technical Aspects

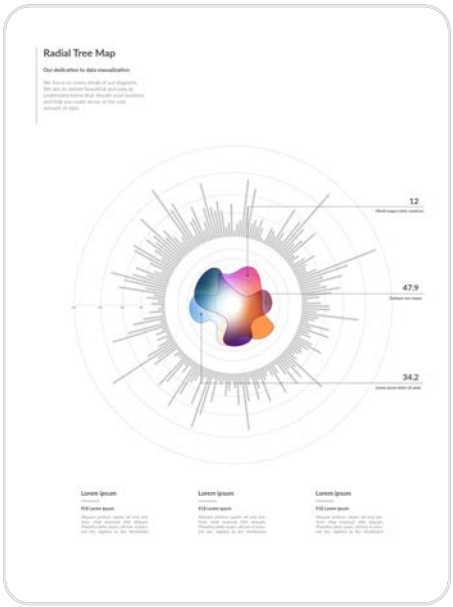
Technical aspects of GoJS

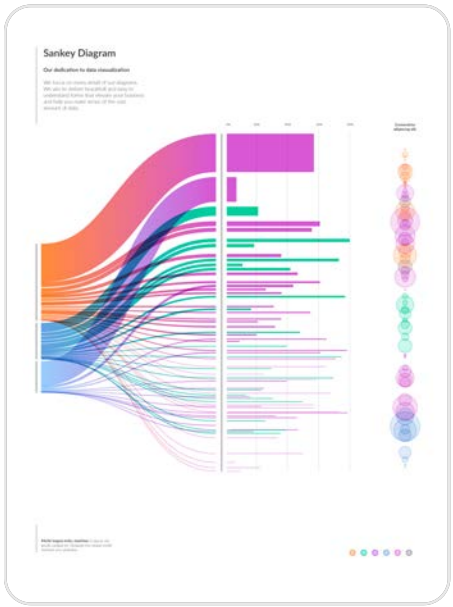
GoJS mainly since it is a paid solution remains a niche product, primarily used by business clients. Therefore, it is neither the first nor the only JS library on the market for creating diagram apps. With this being the case, it is prudent to ask about the features of GoJS that justify any such investment.











But first things first. Developers seeking alternatives to GoJS can always turn to pure JavaScript. It is the most extensive, universal, and let's not be afraid to say it developing programming language. It is a safe and relatively easy-to-use technology that can be used for developing data visualization web tools. Yet, using it in business apps seems... a bit old-school. It is not that it is bad per se; it is just counterproductive, especially when various libraries both paid and free can accelerate development.

Visual JS libraries

Below we present a list of solutions that we believe are worth considering when looking for a diagramming tool.

What are the main technical benefits of GoJS?

GoJS is a JavaScript library dedicated to creating fully interactive diagrams, like all the above-mentioned. However, its flexibility, extensibility, and performance optimization deserve deep-dive.

Flexibility & Extensibility
Extensibility and flexibility are two characteristics of both programming languages and software systems that reflect, respectively, how easy it is to enhance their default possibilities by adding new, tailor-made functionalities and how easy it is to change their given capabilities to be used in a way that wasn't intended originally. Both allow developers to „mold" the technology better to address the individual business needs of company.

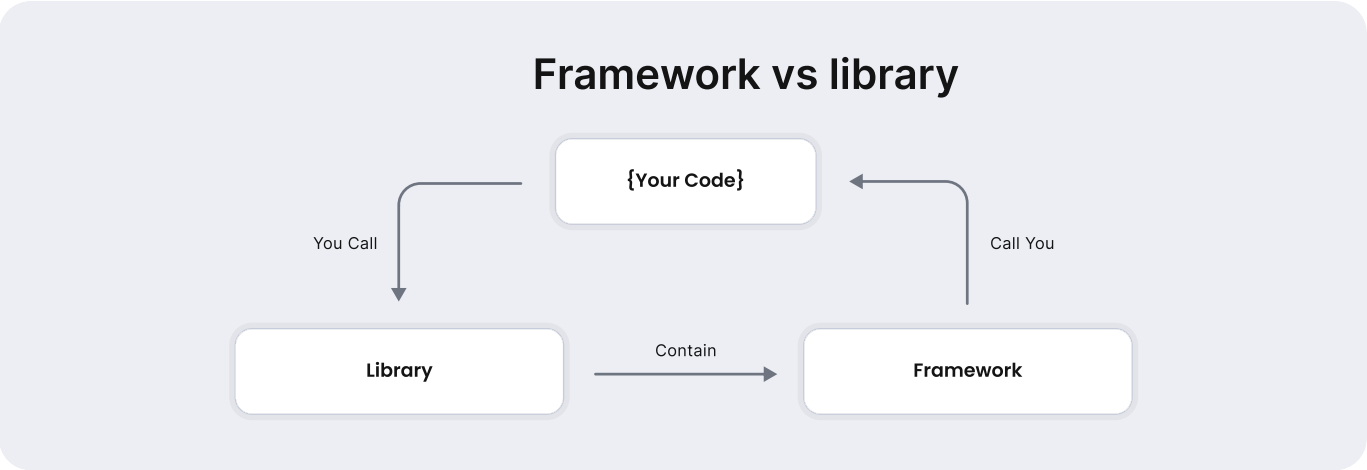
The flexibility and extensibility of GoJS were made possible mainly because, well, it is a library, not a framework. Having said this, we must be clear on the differences between a framework and a library.

Lightning Fast Diagramming in the Browser
GoJS takes advantage of the HTML Canvas to support high-performance diagrams. For creating static documents and printable resources, GoJS supports exporting Diagrams to images and SVG. GoJS supports all modern browsers (IE9+), including mobile browsers.

Framework vs library

A library is a set of ready-to-use functions that can be applied to projects instead of requiring developers to build them from scratch. They can be used to perform particular, repeatable tasks in a given project and are perceived as a „shortcut” that reduces the number of developer hours needed in a project. This „help” comes without limiting the possibilities of customizing the given functions.

A framework, on the other hand, can be perceived as something more codified. It is some sort of skeleton (or a frame) of an application that provides both particular, ready-to-use elements (similar to a library) and a general pattern of how they should be utilized. A framework arbitrarily implies the way an app must be written and defines how it looks and behaves.



A library gives much more freedom, which benefits flexibility. Flexibility, however, often opens the door to a... mess, which, especially within the most advanced projects, can be very challenging. How does GoJS solve this problem?

In the case of GoJS, the risk of code being „inelegant” was partially reduced by the possibility of using TypeScript. This well-known superset of JavaScript „enforces” best practices in writing code. By pushing developers to explain their assumptions precisely, it enables them to avoid a lot of typical errors and makes it easier to maintain full control over even the most robust projects.

Using TypeScript seems valuable, especially in projects involving many teams working at different speeds, as, no matter when they jump into the project, the entire code is always quite easy to understand.

TypeScript allows keeping the code in order without enforcing framework-specific rules, and, importantly, is optional. Developers can go with TypeScript when they find it useful, but there is nothing stopping them using pure JavaScript in GoJS. In the end, TypeScript is always „translated" into JS.

GoJS, as a library, is a „set of tools", but also as a library can't be perceived as a „closed garden." It is rather an extensible ecosystem.

The extensibility of GoJS is the result of two main factors. First, as we mentioned, it gives more freedom by default, not forcing us to use any specific rules, as a framework would. And it is safe to say that anything possible with JavaScript is also possible with GoJS. It helps but not in any exact, arbitrarily implied way.

However, this is just the icing on the cake. The crucial foundation of the extensibility of GoJS is the fact it is... a library, not an editor for drawing diagrams, which there are plenty of on the market. Tools, such as Draw.io or Miro, are powerful and help non-technical users present data. Still, their limitations are clear when it comes to creating any more advanced, tailor-made solutions.

GoJS, by virtue of being a full-fledged JS library, enables companies to create an app aligned with their individual needs by freely defining their own business logic.

The out-of-the-box features of GoJS that support interactivity (unlike its free competitors such as D3, GoJS includes a full package of them: drag&drop, undo/redo or clipboard support) don’t limit any customization possibilities; they can be overwritten and expanded freely using JS.

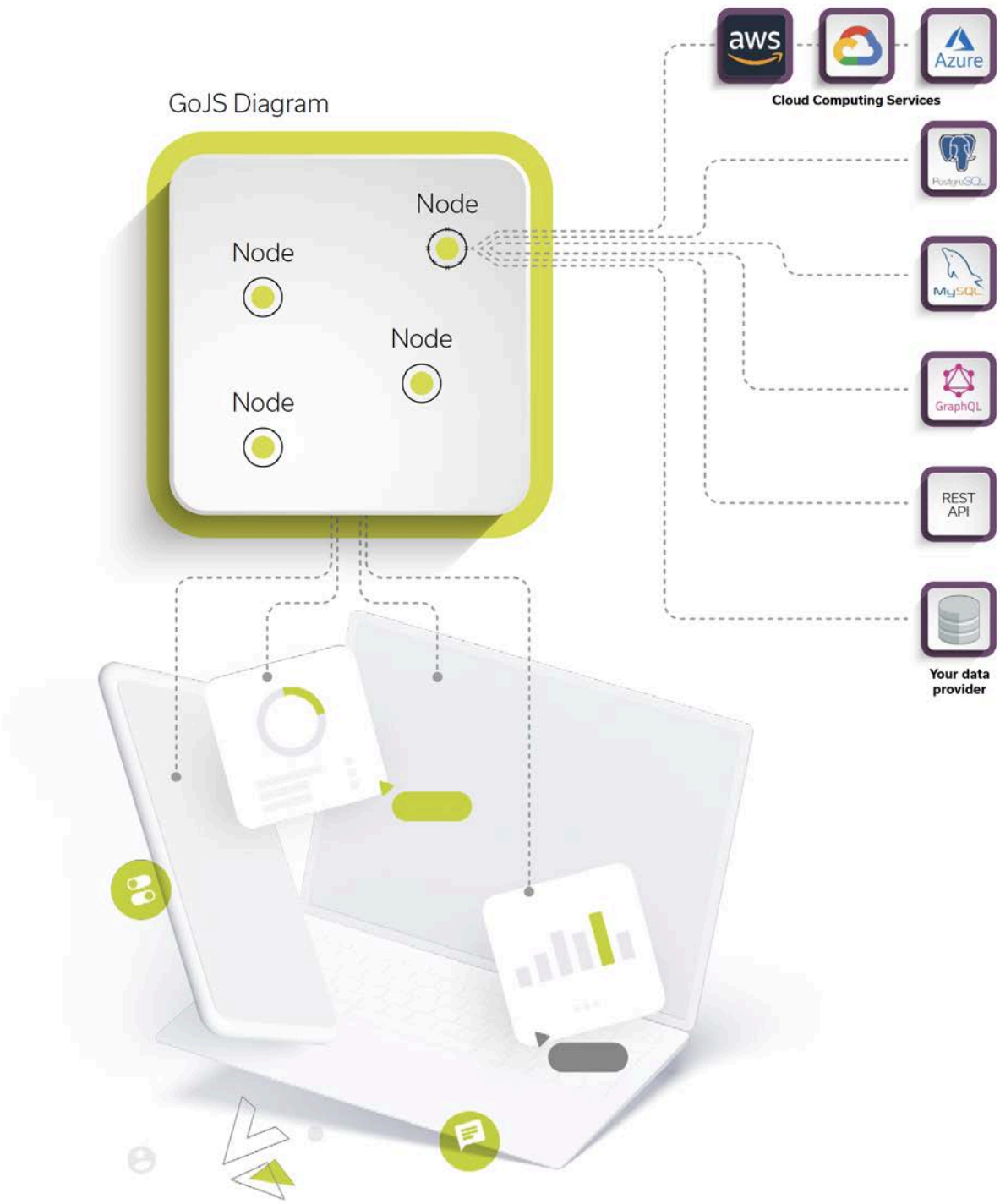
The OOTB functionalities make the investment in paid licenses affordable. Developers can instantly access the most repeatable features and don’t have to build them from scratch which saves time and money, as developer hours are expensive.

Diagrams written in GoJS are fully editable, which is not always achievable while using the free alternatives.

No strict dependencies, but limitless integrations possibilities

Thanks to this feature, it is possible to create a variety of custom-made apps, from quite basic ones, such as an app that can be filled with data in an Excel-like tab and instantly translated into a diagram, to apps that allow running advanced simulations, presenting complicated business rules, or monitoring processes.

GoJS can be integrated with any external business tools such as CRMs, ERPs, marketing automation platforms, or any analytical tools via API or by other means. Thanks to this feature, GoJS allows visualizing data from many sources, and seeing and analyzing the big picture can’t be overrated in any business.



With GoJS, the sky is the limit, and it is not just a hollow marketing claim. This library is far from being just a tool for drawing data visualizations; it allows to extract data from separate silos, aggregate them, and, thanks to dynamic visualizations, interpret them in a continuous flow, adapted to the individual business logic.

GoJS, although it can be integrated with any external and third-party services via API, by itself doesn't force any dependencies from either an external library or framework, nor does it require backend server functionalities.

No dependencies from external libraries
It can be run entirely on the client-side, which shortens time-to-market and increases flexibility in utilizing external tools. It can be used as a part of a larger project written in Angular, React, Vue.js, or vanilla JavaScript, which benefits maintenance. Potentially, support for those frameworks can cease at any time, forcing companies to proceed with a costly and time-consuming migration.

No dependencies on server functionalities
There are a lot of JS libraries that require transferring some part of their functionality to the server side due to their level of complexity. In that case, whether we like it or not, we are obliged to set up a server and therefore, pay additional fees. With GoJS, it's a different story. The entire code can be run in the browser and, if our particular application doesn't require it, there is no need to deal with server issues. GoJS itself doesn't require it.

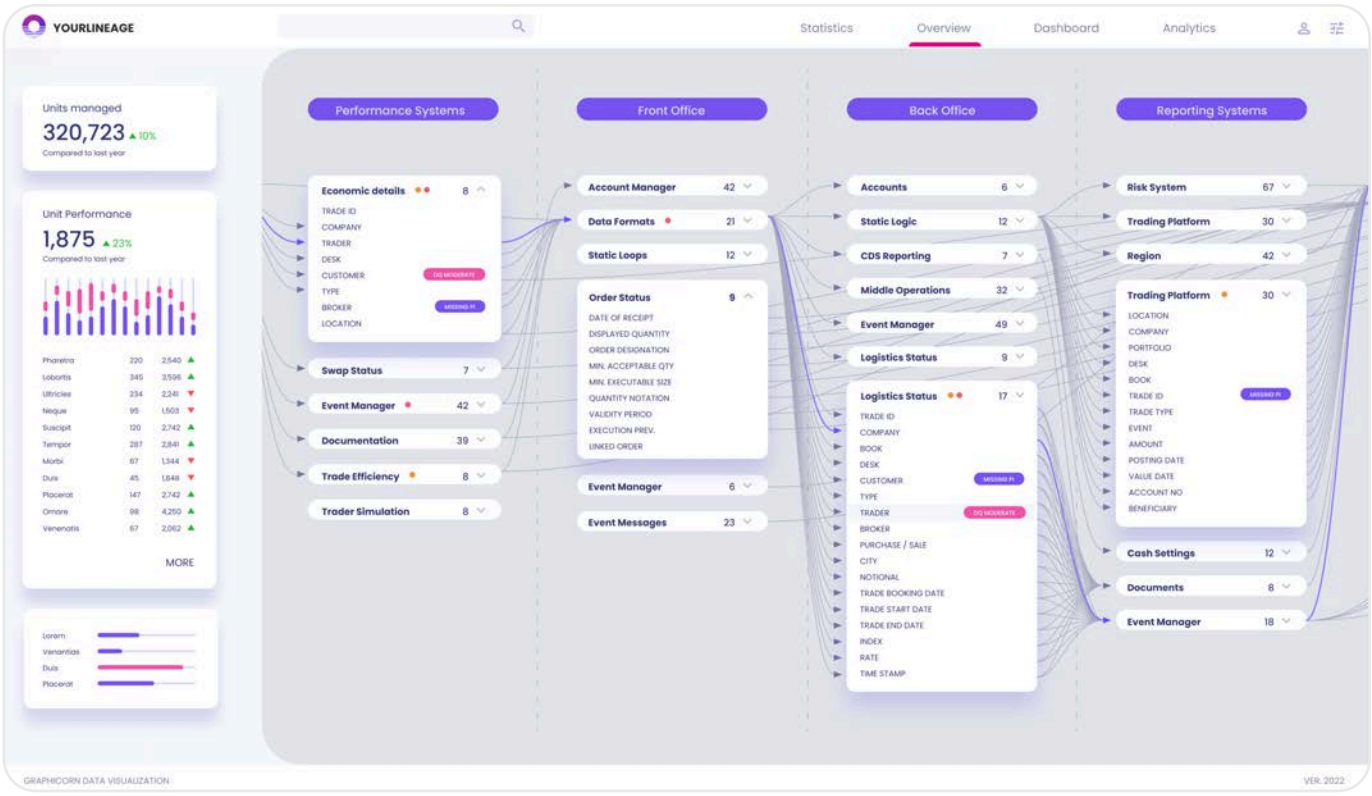
So... GoJS is independent, integrable with third-party tools, and flexible, which inevitably leads to the question of where the catch is?

Well, it may seem that these features are mutually exclusive or, at least, there must be some bottlenecks to overcome. In fact, there are none implied by GoJS per se. It is rather a matter of integration quality that must be taken into account. Poorly written integrations can cause damage to, e.g., performance, but it has nothing to do with the languages being used.

Performance. A feature is taken care of by default

GoJS was hailed as one of the best performing diagram-dedicated solutions. However, since performance is not a zero-one issue, the matter requires an in-depth explanation. Given that the GoJS code runs on the client-side, its default performance-friendliness may seem suspicious since the general rule says that the more code we „push” to the browser, the worse the performance.

However, that is not the case with GoJS-based diagrams. GoJS, thanks to its well-optimized performance, allows performing even the most advanced calculations on the front-end at optimal speed, with no need to set up additional infrastructure. This is, in fact, the most stable and safest option, given that there are often problems with the frequent transfer of large amounts of information between the backend and the frontend.



Sounds great, doesn't it? But what exactly are the performance-friendly features of GoJS? There are two main features to note: Canvas usage and support for virtualization. When it comes to Canvas, browsers can smoothly run the code. It all comes down to executing the straightforward instruction straightforward instructions; there is no need to build a DOM tree or understand the hierarchy of elements in any specific (and time-consuming) way.

Virtualization is a feature that allows displaying only a fraction of a diagram in the viewport at a time, and rendering further elements as needed. Calculating the position of all aspects at once and here we are talking about diagrams consisting of thousands of nodes would take a lot of time and be completely unnecessary since the screen size is still the limiting factor.

What are the alternatives to GoJS?

JS visualization libraries are the right start for the creation of the tools to manage any data in the company. Their diversity and unique features don't limit the tool creators. As JavaScript becomes more popular in data visualization, new libraries appear on the market to enable the crafting of beautiful charts and graphs for the Web. The below examples indicate various libraries to build up the visualization tools based on a wide range of diagrams and charts with the focus on responsiveness, fast working, framework compatibility, and look & feel aspects.

jsPlumb

Origin: **United Kingdom**
Initial release: **2019**
https://jsplumbtoolkit.com/

jsPlumb is an open-source solution for building editable diagram apps that offer many essential features out-of-the-box, such as undo/redo, automatic layouts, zooming, loading/saving data, and many others. The jsPlumb toolkit allows creating various types of diagrams such as org flowcharts, circular, process flow diagrams, sequence diagrams, all with full mobile support.

yWorks

Origin: **Germany**
Initial release: **2001**
https://yworks.com/

This library provides you with plenty of ready-to-use tools that create both simple graphs and complex diagrams, visualizing complex data flows. All apps created in yWorks run in browsers, including mobile versions.

D3

Origin: **Worldwide**
Initial release: **2011**
https://d3js.org/

D3.js is also a JavaScript library for managing documents using data. It is based on HTML, SVG, and CSS and allows you to build any type of visualization.

JointJS+

Origin: **Czech Republic**
Initial release: **2009**
https://www.jointjs.com/

Rappid is the paid commercial extension to JointJS Core, a free, open-source JS library that natively supports visualization and interaction with diagrams, graphs, and more. It extends its functionality with interaction components, additional shapes, and widgets, enabling you to build of advanced HTML5 applications.

Cytoscape

Origin: **USA**
Initial release: **2002**
https://cytoscape.org/

Cytoscape, originally invented for biological research purposes, grew into a general platform for complex network analysis and visualization. Its core distribution provides a basic set of features for data integration, analysis, and visualization.

React-vis

Origin: **USA**
Initial release: **2009**
https://uber.github.io/react-vis/

React-vis is a React visualization library, designed to work just like this the Facebook-backed framework. It has properties, children, and callbacks that can be composed. It handles a great number of charts, from area charts to treemaps.

JS libraries comparison

	GoJS	yWorks	JointJS+	Cytoscape	jsPlumb	ReactVis
Customizability	✓	✓	✓	✓	✓	✓
Data interactivity support	✓	✓	✓	✓	✓	✗
The object interactivity wit drag&drop use	✓	✓	✓	✓	✓	✗
Performance-optimization that enables smooth navigating over large diagrams	✓	✓	✗	✓	✗	✗
Changing object appearance based on custom conditions	✓	✓	✓	✓	✓	✗
External libraries and layouts integration	✓	✓	✓	✓	✗	✗
Integration with frameworks (React/Angular) responsible for how the app looks	✓	✓	✓	✓	✓	✓
Access to automatic graph layouts	✓	✓	✓	✓	✓	✓
Any diagrams presentation	✓	✓	✓	✓	✗	✗
Animations within the library	✓	✓	✓	✗	✓	✓
"Snap to Grid" option	✓	✓	✓	✓	✗	✗
Grouping mechanism (included expanding and collapsing groups)	✓	✓	✓	✓	✓	✗
Collision detection within the objects	✓	✓	✓	✗	✗	✗
Line routing avoiding objects	✓	✓	✓	✗	✓	✗
Placing ports in any place in a node	✓	✓	✓	✓	✓	✗

✓ True ✗ True — Limited functionality / requires external plugin — Need to be implemented by the developer, but the library gives tools for it

Note: The absence of D3 in the list may be surprising for developers who are fond of this particular JS library. D3 enables manipulating documents based on data, supports the full capabilities of modern browsers without tying developers to a proprietary framework, supports a combination of powerful visualization components and a data-driven approach to DOM manipulation. - Besides this, it is really fast, which enables supporting large datasets and dynamic behaviors for interaction and animation. So... why did we decide to exclude it from our comparison? Although it is surely possible to create robust diagrams with D3, this library provides developers with just a „bare skeleton." While the rest of the above mentioned libraries come with numerous ready-made tools that speed up app development, D3 requires much more custom work from developers. We believe that, due to its generality, D3 cannot be compared with more specialized libraries.

Still can’t decide which technology to choose?

> No worries! We’ll help you pick the best option for your goal and then, if you need us to, we’ll deliver a working solution that will delight the users.

Łukasz Jaźwa
CTO at Synergy Codes

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or check

GoJS Consultancy Services →

Final words

The importance of data in business is constantly evolving. With this in mind, companies are increasingly investing in tools for data visualization, process mapping, and information flow development. Regardless of the industry, entrepreneurs use data to develop their competencies and improve decision making processes.

Called the „new oil", data is the basis for complete, interactive tools development supporting the above-mentioned goals. Therefore, it is difficult to ignore the rapid growth of programming languages, libraries and frameworks built specifically for this purpose, especially JavaScript, which is the source of, and the underlying technology behind GoJS.

GoJS is a well-designed solution for creating highly specialized interactive diagrams used not only in data visualization, but also within BPM.

Compared to other popular libraries, GoJS has a dozen or so crucial technical functionalities that make it, among paid libraries, a popular solution for developers who create data processing tools.

GoJS allows full customization, supports data interactivity, and allows you to use the convenient drag & drop function. It is also worth mentioning that the optimization function is enabled when navigating large diagrams and integrating with external libraries. In short, GoJS allows you to create, animate and present almost any type of diagram. Speaking of BPM-related tasks, it works great as a source for creating functionalities that present data flow, grouping, or connecting objects using non-intersecting lines.

The functionalities mentioned in the e-book perfectly match the business benefits derived from the usage of the GoJS library. Thanks to this library, even non-technical employees or project members can count on quick actions and support their decision-making processes. This leads to avoiding many mistakes typical of processes and tools that are not based on data visualization.

GoJS is therefore a comprehensive library that supports the development of technology and business. It allows for the wide use of components to build interactive custom tools, in line with the „sky is the limit" principle. We look on with great interest at the possibilities of not only extending such competencies but also constructing new solutions for each industry.

Technical benefits of GoJS

- Flexibility & Extensibility
- No strict dependencies, but limitless integrations
  - No dependencies on external libraries
  - No dependencies on server functionalities
- Performance-optimization

Business benefits of GoJS

- Monitor & optimize processes
- In-depth analysis of a company's workflows
- Tracking the results of processes
- Enhance cross-department communications

The selection of the appropriate JS library depends on many factors. Recognition of technical functionalities allows you to understand the level of development of the library's capabilities.

The technical aspects of JS visual libraries diversify the possibilities of using them in various ways in building visualization tools. The following comparison, due to the most popular technical functionalities, allows you to choose the appropriate library tailored to the needs of a given project.

About the authors

We are the team of dedicated design & engineering experts aims at delivering world-class custom tools for data & process visualizations. We share the top-notch skills to serve your business boost. Meet Łukasz, Tomasz, Kaja and Paulina, who gathered and shared solid knowledge on the GoJS library.

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Leverage your visualizations with us

Synergy Codes delivers custom apps for various types of visualization to elevate your business to a new level.

We draw handfuls from the GoJS diagramming library, which allows us to design and develop custom solutions tailored to the clients' requirements, regardless of the industry.

For over a decade, Synergy Codes has crafted tens of interactive tools and conducted various projects providing in-depth expertise as the Premium GoJS consultants. We find GoJS as the perfect match to serve the most customizable apps and ensure usability at a high level.

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