PrismArch

Deliverable No D7.3

Market analysis and exploitation plan

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Abstract	Business plan to ensure the successful exploitation of PrismArch technology, building on the plan presented in Section 2.2.3. It will include market analysis, a business model for exploitation and concrete actions to market PrismArch's outcomes.
Keywords	go-to-market, business model, commercial, Virtual Reality, VR, Augmented Reality, AR, BIM, CAD, competitors, competition

Copyright

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List of abbreviations and Acronyms

Abbreviation	Meaning
AB	Advisory Board
AEC	Architecture, Engineering and Construction
AR	Augmented Reality
BIC	Bank Identifier Code
BIM	Building Information Modelling
CA	Consortium Agreement
CAD/CAM	Computer-Aided Design & Computer-Aided Manufacturing
CFS	Cost Financial Statement
DoA	Description of Action
DR	Deliverable Responsible
IoT	Internet of Things
IP	Intellectual Property
IPR	Intellectual Property Rights
NDA	Non-Discolsure Agreement
NDA	Non Disclosure Agreements
PC	Project Coordinator
PHP	PHP: Hypertext Preprocessor
PM	Person-Month
PMB	Project Management Board
PTM	Project Technical Manager
QMR	Quarterly Management Report
R&I	Research and Innovation
SB	Project Supervisory Board
SBM	Supervisory Board Member
SME	Small and Medium-sized Enterprises
ToC	Table of Contents
UG	User Group
UML	Unified Modeling Language
VR	Virtual Reality
WP	Work Package
WPL	WP Leaders

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EXECUTIVE SUMMARY

Problem
Currently available software solutions to visualize/edit CAD projects in VR/AR are not appealing to most AEC professionals because they are compartmentalized, asynchronous or have poor visual quality. Using exports to game engines is still a monodirectional cumbersome process, which resulted in VR/AR solutions struggling to take off so far.

Solution
PrismArch aims to create the ultimate tool for AEC professionals by unifying the various phases of design and related databases into a collaborative immersive environment where AEC professionals can work together by accessing CAD/BIM editing tools. The proposed software will be based on Unreal Engine and compatible with McNeel Rhinoceros (a CAD software widely used in architecture) and with Autodesk Revit (a BIM software that is the de-facto standard in architecture and structural engineering) for synchronous collaboration. Asynchronous collaboration will be handled by Speckle connectors to other platforms, including structural engineering software. The user experience will revolve around the concept of data-sphere, which involves both the universal availability of a certain user's data and different levels of access to information for different users. The main use of the product is in the sketching and design review phase of companies operating in the AEC industry.

Market
The primary audience for this solution will be the several million Revit users[1] and the hundreds of thousands Rhino users[2] who are active in the built environment.

Competition
In this budding industry there isn't a single company that offers a comparable solution, but rather a collection of companies that cover portions of the functionality that PrismArch will offer. Some worth mentioning are Nvidia Omniverse, Enscape 3D and The Wild. Relatively to all the aforementioned and other companies in the space, PrismArch has the competitive advantage of being native to the CAD/BIM platforms already used by AEC professionals, no need for exports or other lengthy expedients; users can collaborate since the early stages of design rather than only in the final ones like other solutions. Moreover, a more captivating UI/UX and connectivity to other platforms are also a valuable element of distinction.

Distribution & Communication
PrismArch will be distributed through direct sales and reselling partners. In order to stimulate demand, there will be constant branding activities on high-resonance media paired with some performance online marketing.

Sustainability
This software will be sold on the AEC market and the revenues will be shared among the consortium members, according to mutual commercial and licensing agreements, to address development and maintenance expenses.

[1] Source: Autodesk 2020 investor overview.
[2] Source: McNeel staff at a 2019 conference mentioned 1.5m users globally, of which about ⅓ in AEC.

1. INTRODUCTION

As of the time of this document, PrismArch is a research project. The objective of the present document is to analyze the economic sustainability of a commercial exploitation of PrismArch's research results and to examine the implications.

The chosen approach is to consider it as if it was a standalone project that has to be independent and sustainable. Given this premise, initially we'll go through an overview of the present-day market and future trends; then we'll discuss in detail the offer meant to satisfy such demand, examining also the choices regarding pricing; then we'll cover the current and future offer by competitors, making comparisons where due. Subsequently, distribution strategies and marketing/communication will be analyzed, as they imply some critical choices as well. Finally, we'll add some comments on financial sustainability and conclusive words.

We ask the reader to have some flexibility when going through this document, many of these activities are and will be for a considerable period of time a work-in-progress, hence changes are always possible. After all, the secret to success in an industry is to adapt to the ecosystem dynamics, which implies the need for a certain amount of reactiveness and speed of maneuver.

2. MARKET ANALYSIS

2.1. Who are the users

Who: PrismArch is primarily aimed at serving the needs of Architecture, Engineering and Construction (AEC) professionals, which includes: architects, civil engineers, urban designers, interior designers, landscape designers and developers. These professionals already use software platforms such as Autodesk Revit or McNeel Rhinoceros[3]. A sizable portion of these users are also acquainted with Unreal Engine because they already use it or plan to do so in the short-term future[4].

Location: albeit relatively widespread across the whole globe, the geographical distribution of such users is concentrated in advanced economies, in particular in large urban areas in Europe and North America.

Company size: PrismArch is designed to be a holistic solution, valid for most of the firms active in AEC, from the small niche architecture studio to the large multinational engineering firm. However, as the benefit of VR/AR workflows and user-tailored information management is more apparent with high complexity projects, it's more likely that the users will mostly belong to large organizations.

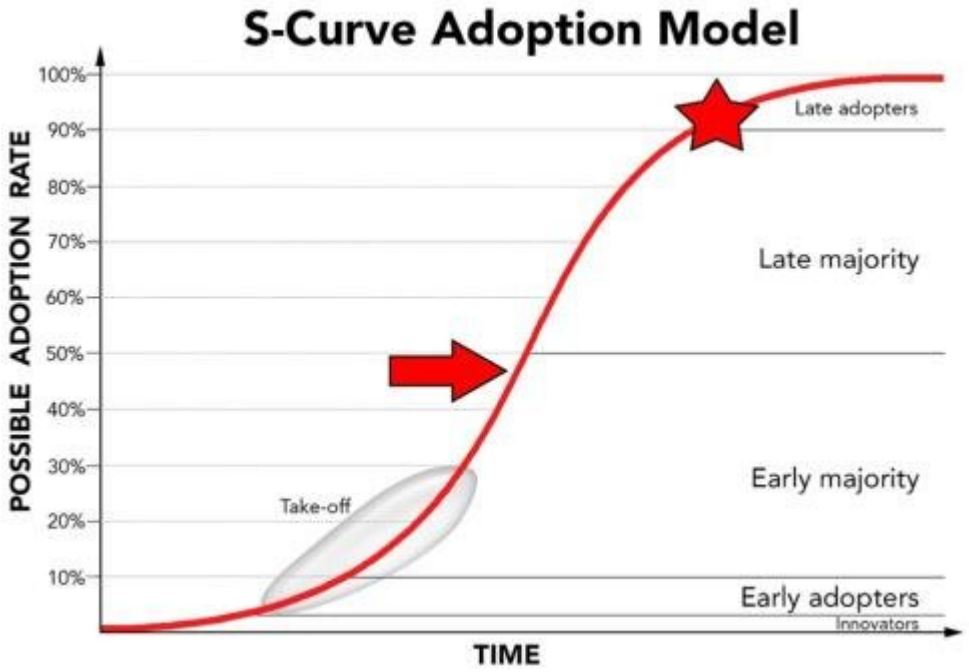
2.2. Issues and opportunities

The AEC industry is notorious for the passionate attachment of professionals to their tools (absolutely legitimate, due to the long training time required to master them) and hence the consequential "stickiness" thereof: a push for innovation in the design workflow will probably encounter some inertia. Nevertheless, change is already here and, slowly but surely, it will soon pervade the industry, starting from the pioneers and the avant-gardists, then spreading to the early adopters and later to the rest of society, with the typical adoption velocity gradient of any technological innovation. The universal compatibility that PrismArch offers, through the Speckle component, can be an enabler of universal collaboration indeed, thus providing momentum against the aforementioned inertia.

It is estimated that currently about 36% of AEC professionals use or aim to use VR to some extent in their activities[5]. This is already an order of magnitude bigger than what it used to be in the early days of the "second coming of VR" (2013-2018), but still not exactly mass adoption. Looking at other technologies' adoption dynamics in the past[6], it's possible to say that in 2021 we might as well be on the verge of the steepening of the VR adoption curve, when the early majority embraces this innovation and VR finally

[3] see footnotes at page 8
[4] Source: Unreal Engine in AEC - AEC magazine (24 March 2021)
[5] Source: RIBA/Microsoft report on Digital Transformation in Architecture (December 2019)
[6] For more on this topic, please consult Crossing the Chasm by Geoffrey A. Moore

goes mainstream. If this assumption holds true, we'll see a four-fold increase in the next 3-5 years and in currency terms the growth rate will most likely keep being in double-digit for another good decade[7].



Currently the CAD-VR market is estimated to be about $1.5Bn per year, but due to the adoption dynamics mentioned above and the natural evolution of most CAD platforms into this new realm, which will imply some tweaking of the definition, it is forecasted to balloon to about $5Bn by the end of 2025[8].

With such a massive rising tide, there will be industry dynamics typical of other tech revolutions: at first a flourishing of hundreds of independent solutions, each with a distinctive approach; later - and we might already be in this second phase - there will be a lot of consolidation, with players merging with each other and a few widely accepted approaches that survive "the churn".
In this context, PrismArch aims to be a unifying platform, a middle-layer that can glue technologies and platforms together, including current standard professional CAD and BIM software, thus generating value for its users.

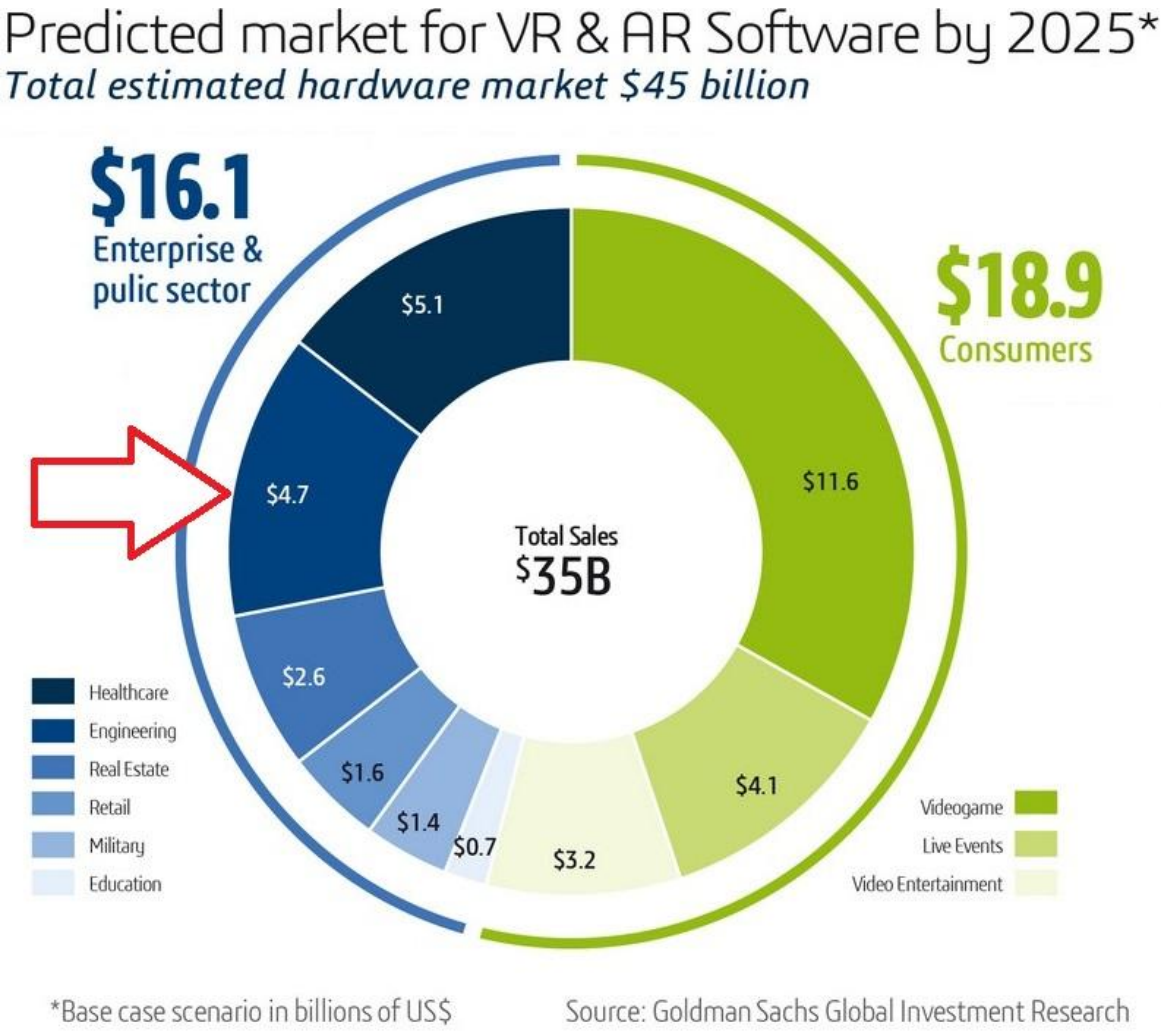
2.3. Market size

In 2018 there were about 40 million CAD users worldwide; the global market was worth around $9Bn, forecasted to keep on growing at 5.7% CAGR in the following decade.

[7] Global AR, VR & MR market analysis from 2016 to 2030 by Milica Radovanović (January 2020)
[8] Source: Goldman Sachs VR/AR report (2016)

In parallel, VR headsets sales are finally starting to take off: according to Statista[9], in 2021 there were about 16 million active VR headsets globally, a number destined to double in the next 3 years. The total VR/AR market is forecasted to reach $80Bn in 2025, of which $45Bn for hardware and $35Bn for software[10].

The intersection of these two industries is estimated to be about 1 million users in 2021, for a market value of $1.5Bn; this figure will keep on growing at a sustained pace to 3.2 million users and $4.7Bn of market value in 2025 (26% CAGR)[11].



[9] Source: Statista - VR headset unit sales 2021-2024
[10] Source: Goldman Sachs VR/AR report (2016)
[11] Source: Goldman Sachs VR/AR report (2016)

3. PROPOSED PRODUCT

3.1. The PrismArch platform

PrismArch will be a modular platform composed of a central stand-alone installable software that runs on Unreal Engine and connects to Speckle, Revit and/or Rhinoceros. Third-party extensions can be accommodated through Speckle connectors.

This software aims to provide an unified design tool for AEC professionals that leverages both traditional CAD/BIM tools and state-of-art real-time technologies, including graphic engines, VR, and cloud collaboration stacks.

3.2. Compatibility

PrismArch is going to be available only for Windows 10 and 11; no compatibility is foreseen for former editions of Windows nor iOS.

The platform is going to be compatible with all commercial headsets, to the extent they rely on SteamVR or Oculus software. That means all HTC, HP, Lenovo, Acer, Samsung, Varjo and Oculus devices, which constitute 99.9% of the current panorama.

In order to use the VR features, like any other VR application, it's going to be necessary to have correctly installed SteamVR (with the Windows Mixed Reality add-on when using WMR headsets) or Oculus software (when using Oculus headsets).

3.3. Minimum requirements

While processor speed and RAM size can vary (the more the merrier, as always), the real bottleneck is going to be the graphic card. Inevitably it has to be a VR-ready graphic card, which means one of the following for Nvidia:

- Quadro (for Desktop): NVIDIA RTX A6000, NVIDIA A40, NVIDIA Quadro RTX 8000, RTX 6000, RTX 5000, RTX 4000, GV100, GP100, P6000, P5000, P4000, M6000, M5000
- Quadro (for Mobile): NVIDIA Quadro RTX 6000, RTX 5000, RTX 4000, RTX 3000, P5200, P5000, P4200, P4000, P3200, P3000, M5500
- GTX/RTX (in all their variations): GTX 1060, GTX 1070, GTX 1080, RTX 2060, RTX 2070, RTX 2080, RTX 3060, RTX 3070, RTX 3080, RTX 3090.

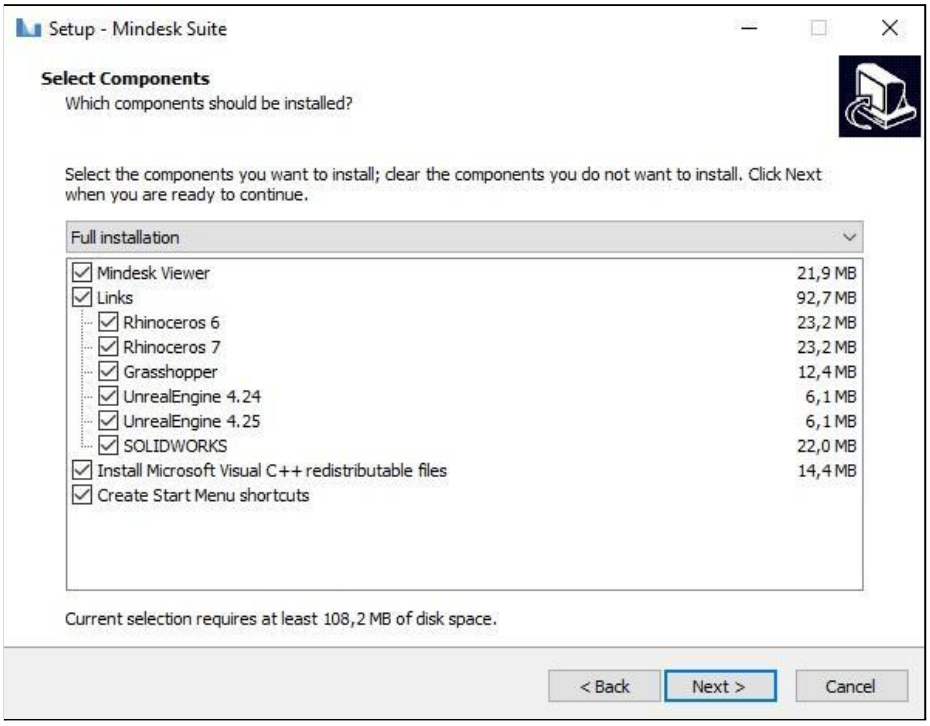
AMD Ryzen can run the software too, as long as they are flagged as VR-ready by the manufacturer.

4. TECHNOLOGY INTEGRATION

4.1. Mindesk Suite

The current Mindesk suite comprises the plug-ins for Rhinoceros and SolidWorks (Mindesk Suite 2021), and Revit (Mindesk Suite 2022), paired with the corresponding Unreal Engine plug-in. In the future the list of compatible CAD/BIM platforms will expand.

Mindesk is a platform whose modules work together to address the needs of specific users. Upon Installation, the user can decide which plug-in to install and hence which component she'll be able to use.



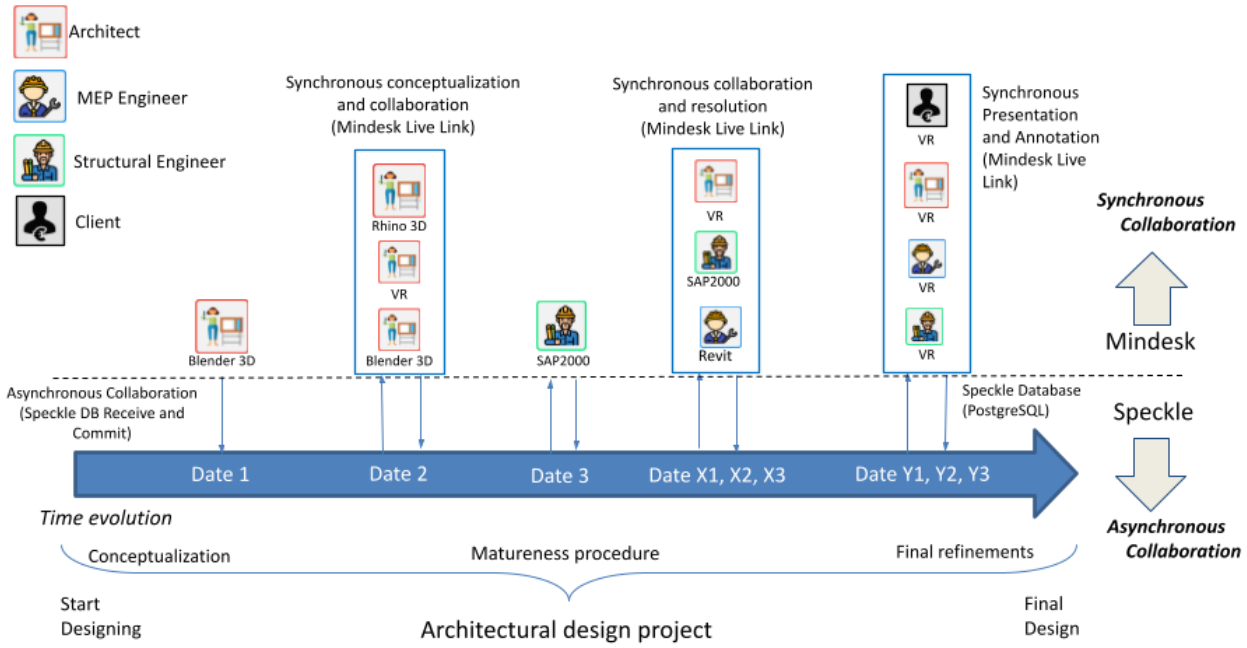
Mindesk installer: modules can be selected/unselected through the checkboxes.

4.2. Mindesk integration in PrismArch

The Mindesk platform provides PrismArch with a flexible software layer that solves the synchronous connection between the PrismArch VR environment and selected CAD and BIM software like i.e. McNeel Rhinoceros 7 and Autodesk Revit. The connection happens through Mindesk's Live Link which enables data to flow in both directions fast and seamlessly, over a local or remote connection. One of the advantages of the Live Link is that the connection exposes certain CAD/BIM features and makes them available inside the PrismArch environment. So, for instance, native CAD geometries (e.g. solid primitives, surfaces, or curves) can be created within Prismarch and contextually update the CAD document. Because the CAD geometric kernel is connected to the PRismarch environment, the geometries created will reflect all the properties of the source CAD.

Mindesk is delivered to PrismArch as a set of API in a SDK[12] that can be integrated in the main PrismArch Unreal code assembly.

Mindesk synchronous collaboration functionality can be appreciated in the flowchart below (taken from D5.1): within the blue rectangles everything is synchronized instantly and is visible to all users. Speckle's asynchronous collaboration capabilities instead come in when the "Commit" button is pressed and the data is synchronized across the whole design project.



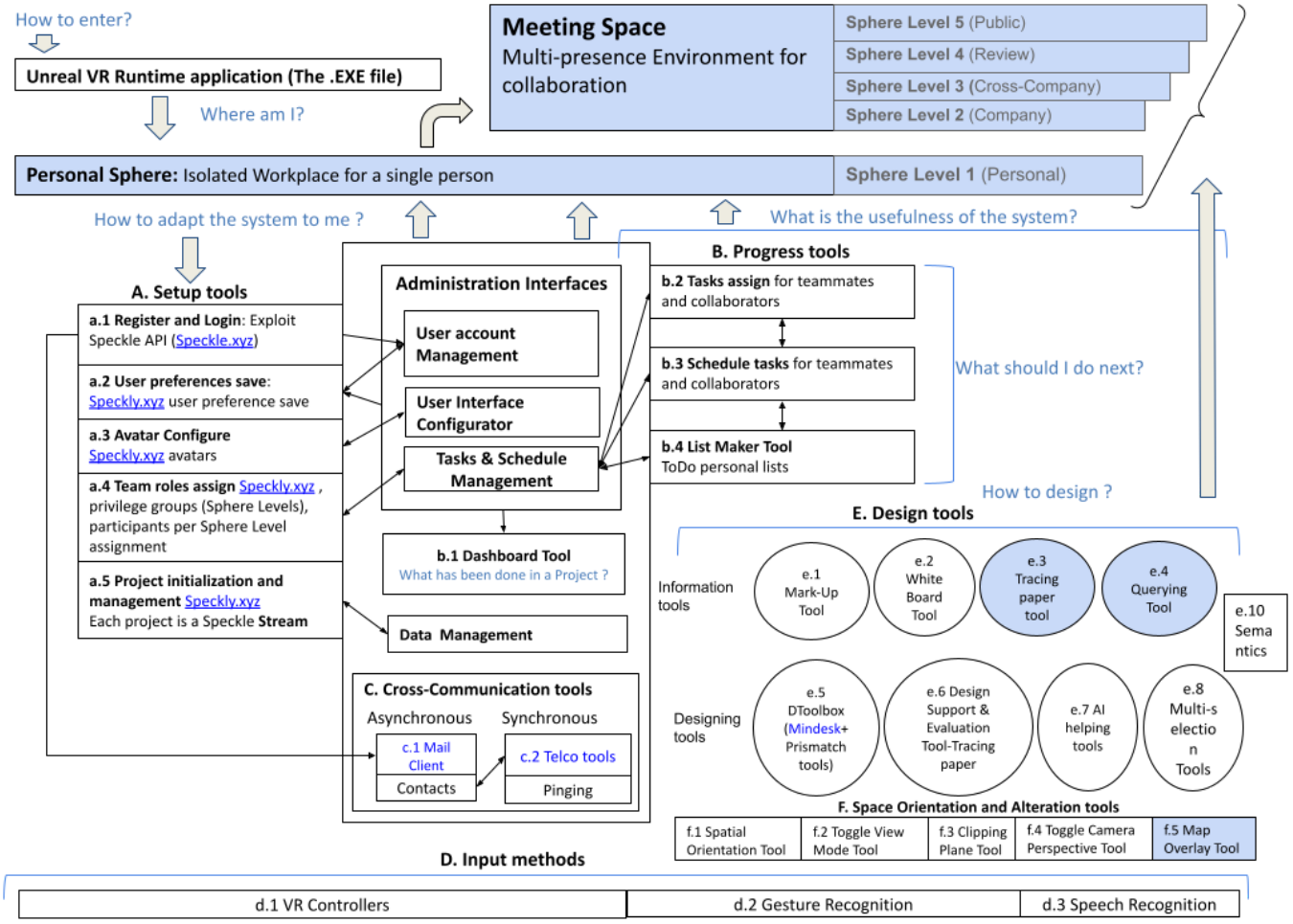
4.3. Speckle integration in PrismArch

Speckle provides PrismArch with a software layer that, complementary to Mindesk, solves the connection between the PrismArch VR with other environments asynchronously. Connected environments include CAD , BIM ando also CAE software like the aforementioned McNeel Rhinoceros 7, Autodesk Revit and many more. This enables multiple designers to commit their works to a centralized database.

Commits are then merged into a single model and changes from each contributor tracked. Speckle is delivered to PrismArch as a set of API in a SDK (libraries) that can be integrated in the main PrismArch Unreal code assembly.

[12] API: Application Programming Interface, a software intermediary that allows two applications to talk to each other.
SDK: Software Development Kit, a collection of software development tools in one installable package, used to facilitate the creation of applications.

A more detailed overview of PrismArch's capabilities and toolset (taken from D4.2) is shown below. Specifically, there's a distinction among the various tools/functionalities supported by either Speckle, Mindesk or other software.



5. PRICING

5.1. Structure and numbers

The pricing model will be a yearly subscription, in line with an increasingly common professional software practice.

The annual flat fee will be 5,000€, also in and will initially include the full feature set. Following a first market test, the licensing price may be adjusted according to the demand level. Also, other variations of the pricing structure will be introduced to further refine and adapt the proposition to each market segment like i.e. modular structure, monthly option, and additional tierings.

5.2. Rationale and testing

The choice of a subscription model ensures a steady cash-flow to cover the past development cost and the recurring maintenance/improvement costs has become the dominating business model in the software world and there is no solid reason why to diverge from this.

Regarding the monolithic price structure, simplification seems to be the best go-to-market strategy: adding layer upon layer of complexity might confuse early customers and move their focus away from the product's unique selling proposition. Optimization, such as splitting into different tiers or modules or smaller time periods, is something that can be added later on, once additional information about the specific segments will be collected.

The price itself is not to be taken as a fixed amount: it comes from an arbitrary blend of criteria, among which: a comparison with competing solutions (more on it in the next chapter), the availability to invest of the early prospective users and an estimate of the value generated for the user (man-hours saved and error-rate reduction). However, it is clearly susceptible to adaptation in case the feedback from the market shall indicate a vast difference in the above drivers.

In order to gather such feedback, besides mere commercial results (which can be misleading, especially in early phases), it's possible to conduct pre-emptive surveys or even "auction" the product to small user groups or demo audiences to establish in a slightly more empirical way whether the proposed price is appropriate.

6. COMPETITION ANALYSIS

6.1. Competitive landscape

6.1.1. Overview

At the moment there are numerous solutions that are somehow trying to bridge professional design software with virtual/augmented reality, each one with a fairly distinctive approach, often dictated by technical limitations and/or deliberate choices. The entire field is fairly recent and still budding, so frequent transformations of the composition of participants or of their products are common.

In the period 2015-2020 there have been hundreds of visualization solutions popping into existence; pretty much all of them were based on Unity and consisted of importing files in .obj or .fbx format - exported from the CAD - into the graphic engine in order to visualize them in VR/AR. Of all these companies in the initial wave, only a very limited number survived[13]. The products/companies that managed to last longer than the rest were either already giants (Nvidia Omniverse, Unity Reflect) or offering some technical differentiation element, such as a proprietary graphic engine (Mindesk or Enscape3D). Even the seemingly successful ones got acquired and are now part of a larger group (IrisVR, Mindesk).

In any case, none of the existing companies offers an all-encompassing solution such as PrimArch proposes to be, hence the following comparison is meant to be read with this caveat in mind.

6.1.2. Incumbents

The most prominent companies addressing the same need that PrismArch is addressing are the following:

- Nvidia Omniverse: a collaborative platform sponsored by the hardware (graphic cards) manufacturer Nvidia, born with the purpose to maximize the usage/need of graphic processors. It is based on the .usd (Universal Scene Description) file format, an open standard developed by Pixar. This platform is real-time and it's based on microservices. It is compatible with a very wide variety of CAD platforms and other software. All in all, the closest and most serious competitor to PrismArch.

- The Wild: the company that acquired IrisVR's main product, ProspectVR. It now offers a collaborative visualization platform that is capable of exporting Revit files in a Unity-based VR experience, which allows users to perform collaborative design reviews of the project and features a rudimentary level of photorealistic

[13] Sources:
Techcrunch - The reality of AR/VR survival (2016)
Techcrunch - VRAR startup valuations reach $45Bn (2019)

materials/lights. Compatible also with SketchUp and BIM360.

- Enscape3D: a widely used solution that features a proprietary graphic engine, it's universally recognized as the easiest to use, albeit with some limitations. Compatible with Rhino, Revit and a few more CAD platforms. It is also the least expensive.

6.1.3. Emerging

As the industry matures, further consolidation is highly likely[14] and with it the chance of emergence of new, more solid competitors is only increasing. However, in the long term the "specialization" trend that sees specific solutions evolving to cover specific needs will probably continue, so a monopoly scenario is unlikely to materialize.

Some "known unknowns" are the potential entrance of giants such as Facebook or Apple in non-entertainment VR/AR space or the ingress in the AR/VR space of CAD giants like Autodesk and other major CAD software houses. Another competitive scenario is the pivot to this world of existing graphic engine providers, like Epic Games or Unity itself.

As of November 2021, no company seems to be on the verge of monopolizing the market of VR professional design solutions.

6.2. Features comparison matrix

Below a table that summarizes PrismArch features compared to existing solutions currently available on the market:

	PrismArch	Omniverse	The Wild	Enscape 3D	Others
VR visualization	✓	✓	✓	✓	✓
Real time live link	✓	✓	✗	✓	✗
VR CAD/BIM editing	✓	✗	✗	✗	✗
Rhino NURBS modelling	✓	✗	✗	✗	✗
Revit metadata retrieval	✓	✓	✓	✗	✗
CAD/BIM cross-functionality	✓	✗	✗	✗	✗
Unreal Editor integration	✓	✓	✗	✗	✗
VR-PC collaboration	✓	✓	✗	✓	✗
Multi-user remote collaboration	✓	✓	✓	✗	✗
Centralized database with history	✓	✗	✗	✗	✗
Price per year per team	**€5000***	>€8,000	>€6,200	€579	>€2,000

*assumed price to be assessed through an on-field market research.

[14] Source: Harvard Business Review - The consolidation curve (2002)

6.3. SWOT analysis

SWOT analysis is a technique to understand Strengths, Weaknesses, Opportunities and Threats of an emerging technology or product, widely used in order to double-down on what works and improve on deficiencies or vulnerabilities.

Strengths and weakness are frequently an internal and present-day matter, while opportunities and threats commonly involve the external environment and the future.

More analytically:

- Strengths are characteristics of the business or project that give it a relative advantage over competitors and substitutes.
- Weaknesses are characteristics of the business that place the business or project at a relative disadvantage or that are perceived as areas of improvement.
- Opportunities are elements in the environment that the business or project could beneficially grab, useful for growing or further strengthening the relative position.
- Threats are elements in the environment that could cause *latu-sensu* negative effects to the business or project.

Below a SWOT analysis of PrismArch in the current competitive space:

Strengths	**Weaknesses**
● Best graphics thanks to Unreal Engine ● Innovative UI with fluid workflow ● Most integrated real-time solution, native to CAD/BIM ● Cross-discipline: design, architecture and engineering features	● Requires knowledge of underlying tools to be used ● Middle layer susceptible to changes, requires frequent updates
Opportunities	**Threats**
● Become the industry standard ● Expand to other CAD platforms/industries	● Dependant on APIs and other CADs that can be shut down or amended ● Major partner or corporate could step in and cannibalize it

7. DISTRIBUTION CHANNELS

7.1. Overview

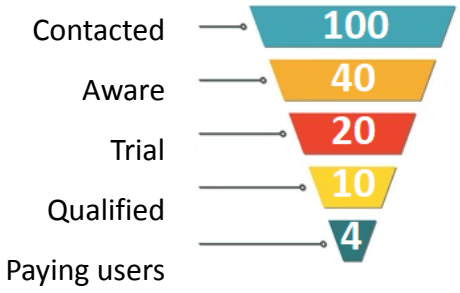
PrismArch will be distributed both directly, through the direct offering of the solution to contacts/prospects in the network of the consortium partners, and indirectly, through a network of specialized software resellers.

The objective is to get the software in the hands of as many AEC professionals as possible, as fast and as efficiently as possible. So, granted that being introduced to PrismArch by someone who contributed to its creation is probably one of the best ways to familiarize with it, the scale and outreach potential of existing software resellers is probably going to have a much wider impact on the number of users involved and is therefore to be regarded as an equally relevant, if not even superior, component of the distribution strategy.

7.2. Direct distribution

Consortium partners will be able to offer PrismArch to their contacts, earning a commission on it.

The outreach effort will probably follow the typical dynamic called “funnel”: of all the contacted prospects, only part will actually become aware of the existence of PrismArch; of all the ones aware of it, only a fraction will get to try it; out of the ones who tried it, only some will find it useful and out of those, only a few will ultimately decide to purchase the solution.
Below an estimated percentage of the users at each stage, indexed over the original number of contacted people, based on direct experience and industry literature[15]:



Needless to say, there will be the need for a proactive effort by consortium partners to move users from one stage to the next, trying to improve the conversion rate at each stage; this is a process that takes several trial & error feedback loops to refine.

[15] Example: Christopher Janz (Point9 Capital) - The Goldilock zone os Saas metrics

This would represent a complex technical sale; even if paired with an effective communication campaign, the envisioned sales cycle will last at least a few months anyways.

7.3. Indirect channels

As mentioned earlier, existing CAD software resellers are of paramount importance. The vast majority of Revit[16] and Rhinoceros sales happen through resellers, who are already well acquainted and deeply rooted in the buying departments of the companies who will end up using PrismArch. It's unthinkable to consider skipping or circumnavigating this essential piece of the distribution.

There are about 300 authorized Rhino resellers and several hundreds Autodesk partners globally. For the purpose of PrismArch distribution, besides CAD/BIM resellers, it could be sensible to expand the category of potential indirect channel partners also to AEC professional software and hardware resellers *lato sensu*, as the familiarity with potential users is not strictly defined by the specific product purchased.
All in all, we're looking at a cluster of potential channel partners of less than a thousand companies, a manageable number in terms of initial outreach and management once signed-up partners start to accrete.

Deal structure: a standard resale agreement will be proposed to perspective partners. The agreement will allow resellers to buy PrismArch software modules in bulk or separately at a discount price; the difference with the MRSP[17] price (usually between 20% and 35%, depending on sales volumes) constitutes the reseller margin.
Local promotion, user onboarding/training and first line of support will be part of the partner responsibilities. However, during the partner itself's onboarding phase, PrismArch consortium members will offer training to the partner's staff in order to transfer as much technical and business knowledge as possible.
The discount price structure is to be preferred to the kickback structure (when an incentive is given ex-post; it requires punctual oversight and accounting) because it greatly simplifies the relationship between partner and consortium members. Discount percentage can always be adapted at a later stage if necessary. Similarly, sales quotas or minimum promotion efforts or other rigidity elements can be also introduced at a later stage.

Channel issues: the channel has to be managed in order to minimize intra-partners overlaps or conflicts. Although the object of the agreement is immaterial and hence very mobile by its very nature, there have to be clear rules about territorial competence when signing the agreement with each partner. In particular, global mandates have to be avoided if possible, as they are typically a source of misunderstandings and confusion.
In addition to geographical limitations, it's wise to also consider industry or other types

[16] Source: Autodesk FY2021 report;
[17] Minimum Reseller Suggested Price

of limitations, in case of many partners occupying the same economic area. One potential tool for the resolution of potential confusion/conflicts is a system of lead logging, that would remove any ambiguity about who has been working on which opportunities; however, this is an advanced topic to be discussed/implemented only when the case presents itself and not so far away from the issue itself.

8. COMMUNICATION AND MARKETING

8.1. Communication

8.1.1. Branding

It is of utmost importance to generate brand awareness. PrismArch has to become almost a household name, a top-of-mind reference when talking about immersive design. In order to do so, it's necessary to produce content of various types:

- Videos: besides VR itself, this is probably the most effective media to convey the innovative aspects of PrismArch. Branding videos have to be concise and convey a few essential messages about values, ambitions and other high-level concepts. The animating principle has to be to "show something, but not everything", in order to always generate some anticipation in the audience, which will trigger a proactive research on the topic.
- Written content: in parallel to videos, it's necessary to send out updates about the projects and its developments in written form, in order to accommodate a greater density of details and allow for re-elaboration by media players. This type of content could be published on the project's website and then relayed through industry media or published directly as a magazine-exclusive and later relayed by PrismArch's own channels.
- Social media: videos and text content will be disseminated through and complemented by social media activities, including sponsored content. Moreover, there's going to be a constant effort to engage specialized publications or media personalities or influencers to gain visibility.
- Events: physical presence (if needed paired by occasional merchandising) is another unavoidable reality. If there are industry events, it's necessary to participate and try to leverage those occasions to get the word out, besides meeting potential users or media protagonists.

The content originated for the aforementioned purposes will be of two types:

- Use cases and innovative workflows produced internally
- Selected works involving current users, like success cases, customer stories, and testimonials. This second type has been demonstrably more effective at engaging unknown audiences in the AEC industry, hence it should be prioritized when possible.

8.1.2. Relevant media outlets

Not only is it necessary to constantly produce content, but also it is necessary to maintain a stable presence on the main social networks (especially within focused areas or pages populated by potential users, decision makers and influencers) and the relevant media outlets.

Social networks listed by priority: YouTube, Instagram, Facebook, Linkedin, Twitter .

Media outlets listed by priority: AD, AEC Mag, Archinect, ArchDaily, Architectural Digest, Design Boom, SBID.org, Engineering.com and others along these lines.

8.2. Marketing

8.2.1. Online

Besides the branding activities, by definition hard to measure and done without a quantitative objective in mind, performance marketing is an activity done with a more nitid cause-effect relationship in mind. In particular, these activities are meant to drive users already belonging to potentially interested demographics to become paying users of PrismArch. In order to reach such an audience, first one has to segment a broad population into clusters of users with common characteristics that make them addressable with certain messages. Then PrismArch will have to reach them through highly targeted text and display ads, typically administered through the usual channel (listed by priority):

- LinkedIn: it allows to target skills related to the CAD use. Potential customers will be efficiently targeted according to their skillset, their workplace, and the groups they follow.
- Facebook: allows to target people who like specific pages (examples: Rhino, Revit, etc…) and/or who list their work affiliation. This will happen on both facebook domain and its display network, where it's possible to "chase" users depending on who they are and independently from the contextual content.
- Google: since it's intention-based, here the focus is on keywords related to the AEC industry on both Google properties and the display network (contextual), which also includes YouTube.

Due to the high degree of targeting and high value of professionals targeted, marketing metrics such as CPC (cost-per-click) or CPM (cost-per-thousand-views) are forecasted to be slightly higher than what's common in other software segments. Specifically, in small-scale experiments run directly by PrismArch partners it has been possible to estimate a CPC/CPM to reach the desired audience in the low single-digit[18].

8.2.2. Offline

Due to the digital nature of PrismArch, outdoor paid marketing such as billboards, displays or posters could probably be a bit ineffective due to a lack of interaction. However, it's possible to include events and similar activities under the offline

[18] Experiments run by Mindesk in 2017-2020 for audiences largely similar to PrismArch target audience (AEC professionals located in Europe or North America) showed a typical CPC of 2.5€ on LinkedIn, 1.5€ on Facebook and 0.8€ on Google AdWords.

umbrella: these activities will be considered part of the performance marketing only if done with a specific ex-ante goal, otherwise they'll be treated like evangelization activities that fall within the branding definition.

8.2.3. Feedback collection and integration

Any marketing activity shall be quantified and measured ex-post, to see whether the effects sorted differ from what expected and adjust the next activities consequently. Marketing efforts are made of constant feedback cycle loops, this case is not different: in order to gain efficacy in the outreach, be it tactical or strategical, it's paramount to cut soon what doesn't work and double down on what is provenly effective.

9. EXPLOITATION STRATEGY

9.1. Joint exploitation

As mentioned in paragraph 7, the venues through which the product can materially get into the hands of users will be primarily PrismArch distributors, even when facilitated by partners' intervention. A "success fee" will be negotiated for the consortium partner making the sale. It is mutually intended that this task could be "packaged" in a way that it could be spun out to a third party if necessary, in order to guarantee the independence of the project. The partner or third party to manage such a task will be chosen upon completion and market test of the project either among the Consortium Partners or through a joint venture thereof.

Granted that there will be an initial central partner or third party that will have to recover the costs incurred in providing the software directly and the envisaged services to distributors, a "licensing fee" - expressed as a fixed amount or percentage of the remaining funds after commercialization costs have been deducted - could be distributed to the other members of the consortium based on the number of paid installations.

Besides the commercial joint exploitation, there could be other ways to jointly exploit the results of PrismArch, for example through some collective returns in terms of visibility, prestige, new connections or developments that might follow this project, etc... These possibilities are better analyzed individually in the next paragraph, but the reader should consider that all these other forms could benefit the consortium partner as a whole.

9.2. Individual exploitation

Surely one way for partners to exploit PrismArch is to use the software itself to improve on their daily design activities, be it for research purposes for the university partners or commercial purposes for private company partners. The software aims at providing additional productivity to its users and, albeit in varying proportions, the people working at the consortium partners seem to be potentially direct beneficiaries of such dynamic.

Then, each partner could have its own specific way to benefit from PrismArch:

CERTH

PrismArch will allow CERTH to establish its position as one of the leading research organizations in the use of VR technologies for pushing the AEC industry towards a fully immersive space for the design and management of complex architectural projects. This is expected to generate new opportunities for research and innovation projects in the AEC domain.

University of Malta

As far as the University of Malta (UoM) is concerned, the PrismArch platform can be used as part of research and education in various departments. For example, the schools of Architecture, Structural Engineering, and Mechanical Engineering could use the platform in the context of teaching cross-disciplinary cooperative design, and project management. Other faculties, such as the school of Fine Arts, could exploit the visualization and immersion capabilities of the platform and include it in the relevant, specialized curriculum. Finally, the Institute of Digital games and the Faculty of Information & Communication Technology can also exploit the platform both for educational and research purposes. For example, the platform can be used as a means of designing virtual environments. Additionally, the platform's designer modeling capabilities can be very useful in the context of affective computing and procedural content generation.

The AI algorithms that are being developed by the UoM, in specific, will be considered in terms of their commercial applications as part of a middleware solution for generative design and/or user modeling. If this is commercially viable, appropriate patents will be filed. Moreover, the IDG aims to re-use their developed AI algorithms in future projects around generative design, AI, evolutionary search, or related domains.

ETH Zürich

ETH Zürich will exploit the experience gained in PrismArch to further research in the field of 3D software development, specifically in the context of advanced tools for design evaluation and innovative construction methods.

Zaha Hadid Architects

As a department dealing with cutting edge innovation and architectural theory, we think that PrismArch is a critical milestone in developing a tool for generating Cybernetic Architecture. During the development of PrismArch, we hope to find new partners and contacts that will open up new opportunities for further research and development. Furthermore, we hope we can devolve aspects of PrismArch for a commercial solution that we can then exploit for the production of commercial architectural design.

AKT II

AKT will greatly benefit from PrismArch in its own workflow, but also from the possibility to expand the existing capabilities of the software through inside research and internally-developed tools, to offer its own clients a better service. The design oriented nature of the practice, focused on interdisciplinary design, will be augmented by using a tool that allows us to interact with the wider design team, exploring solutions in real

time. Prismarch will also provide a solid background to develop further tools that could visualise insights on the intangible design drivers of a project (eg carbon footprint, impact of cost, time etc.)

SWECO

Sweco consists of 17500 engineers scattered throughout northern Europe and it is vital to have tools in place to add value to our clients and reduce waste. It is inevitable that disrupting well tested technologies need to aid the design solution process and PrismArch is a platform which will resolve lots of issues during the lifecycle of a project. The swift to an integrated project delivery which needs all parties participating from the early development until completion and hand over needs tools which will give transparency, encourage collaboration and take advantage of what technology can offer us. With the tools developed within PrismArch the Sweco consultants will be able to identify, communicate and resolve the issues within a construction project, focus more on the design, resolve clashes and enhance collaboration.

Mindesk

An additional way for Mindesk to exploit this innovation would be through the synergistic effects with other company's products: increasing the offering to existing clients and creating an ecosystem that encompasses more and more phases of the clients' activities would surely add value and help fidelize the target audience.

9.3. Collaboration plan

In order to develop the platform or to improve upon it in the future, the consortium members grant each other access to what developed internally by each for the scope and duration of PrismArch. In particular, the consortium members agree on making available any information or license that could be necessary to commercially exploit PrismArch. Specific provisions for the commercial exploitation are already mentioned in paragraph 9.1, but in general the partners agree to collaborate in good faith, even after the formal conclusion of the PrismArch project.

9.4. IPR management

The IPR management strategy is governed by the Consortium Agreement (CA), which includes all provisions related to the management of IPR including ownership, protection and publication of knowledge, access rights to knowledge and pre-existing know-how as well as questions of confidentiality, liability and dispute settlement. In the CA the Partners have identified the background knowledge included and excluded.

If there is an innovation substantial enough to be protected, the CA disciplines the obligation to do so. Each partner will own the intellectual property developed for its module. Joint filing is encouraged when possible and/or appropriate.

The type of intellectual property to be developed for this project is primarily code, which can hardly be patented. As a matter of fact, parts of PrismArch use open-source software and hence are subject to the typical limitations/obligations of such circumstances.

9.5. Licensing

The CA disciplines the obligation to exploit the project results, either directly or indirectly. The latter option presumes licensing or opening up the ecosystem to application developers and interface designers that will build/integrate their software tools into PrismArch. This will most likely happen through an SDK or API.

The choice of the type of licensing model to adopt for such aperture is to be taken jointly by the partner at a later stage, once the interaction among the various components of PrismArch in terms of data are fully defined.

10. METRICS

If PrismArch had to be measured with private-sector metrics, the first and most important metric would probably be whether it can be an economically sustainable project: if the revenues from the sale of the solution are higher than the maintenance and additional development costs, it could already be considered a success.

However, the measure of success of such a project should probably be geared more towards indicators that are different than the ones typically used for private investments. In particular, a collection of appropriate measurable indicators could be:

- The economic growth produced by the project: new companies creation, increase in productivity for users, etc...
- Increase in knowledge intensity: new patents, know-how spillovers, etc…
- The increase in collaboration among EU member countries and institutions: cross-national shareholdership, intra-EU trade, etc...
- New jobs creation, both as a direct and indirect consequence of the project
- Other second and third order effects

11. RISKS

There are many risks that might have an impact on the financial sustainability of the project, let alone its survival. Not all of them are of financial nature.

The first risk that comes to mind is a classic in any consortium: fragmentation. If at a certain point one or more technology holding partners resolve for a change in the commitment towards the continuous support and exploitation of the newborn product, they would leave behind also a critical vacuum in the development or roll out of the project. This risk has already been regulated in the project agreement, but in sight of a continuation of PrismArch to fully realize its commercial potential, a new agreement has to be formed, with particular focus on the instance of a partner leaving. In general, the best practice is not to have non-redundant critically important tasks or people, in order to resist any shock that might happen along the way.

Secondly, there's the risk of legal troubles arising from any technical issue that has further implications. Some examples that come to mind:
- a data breach by malevolent actor, which exposes private users data to the public and leaves PrismArch legally liable for potential damages incurred by the users;
- IP violations that are discovered only through a third-party suing PrismArch;
- health issues caused by the product usage;
This list may as well continue, it was meant just to give an idea of the potential unknown that could affect the survival of the project: any of the aforementioned issues (or similarly critical ones that have not been mentioned) could spell the end of the project if the legal liabilities are superior to the expected revenues of continuing the commercial activity beyond the research phase.

Finally, there's always the unavoidable strategic risk. Namely: big players killing the project through competition. This risk cannot be eliminated, but rather managed by always keeping an eye out on industry developments and actively trying not to be outmaneuvered by other players with more resources.

12. CONCLUSIONS

In the market there seems to be a solid case for PrismArch: an unsatisfied need appears to be common among AEC professionals; the “pieces of the puzzle” that will compose the solution can be taken either from existing tools or could be created ex-novo and put together by partners in a cohesive way that will address that need.

In this document we have gone through the why, the what and the how this project will go from idea to reality. The topic could be fairly complex, so some simplifications were inevitable; we hope to have covered the most salient aspects of the market analysis and subsequent joint exploitation plan, especially from the commercial point of view.

Given the highly technological context and the consequent high speed of change, during the next 12 months some aspects of the above analysis or action plan might change, but those variations would be duly reported in the following deliverable.