



Chapter 12

Innovation and Marketplace: A Vision for the European Language Grid

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Abstract This chapter provides a comprehensive overview of innovation and the ELG marketplace as core elements for the generation of value and the creation of an active, attractive and vibrant community surrounding the European Language Grid. Innovation is an essential element in making ELG a credible and sustainable undertaking. However, it does not happen by itself nor materialise in a vacuum. Consequently, ELG provides a habitat for various kinds of innovation and a home for the necessary community to put innovation into action. The marketplace is essential for attracting participants supplying and demanding services, resources, components and technologies on a European scale. Innovation and marketplace – as well as the overall business model – are tightly connected and need to be developed and managed in a joint manner. Clearly, this is not a one-off activity, but rather needs to be carried out continuously and extend into the future. ELG is designed and created to promote the excellence and growth of the European LT market, creating new jobs and business opportunities and supporting European digital sovereignty. Encompassing a wide array of technologies and resources for many languages spoken across Europe and in neighbouring regions, it contributes to the Multilingual Digital Single Market as a cross-European driver for innovation.

1 Introduction

The ELG marketplace and the kinds of innovations it enables form central elements of ELG and its goal to become the *one-stop-shop for Language Technology in Europe*. These aspects are closely interlinked with a series of further topics concerning the business aspects of ELG in a wider sense, none of which can be viewed in isolation but rather need to be approached in a connected and holistic manner.

Artificial Intelligence (AI), Natural Language Processing (NLP) and Natural Language Understanding (NLU) are highly active areas of research and development

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leading to novel applications on a continuous basis. Over time, new actors enter the stage and change the course of events. In this highly dynamic landscape it is imperative to constantly monitor progress, remain alert and be able to adapt to newly emerging trends. Consequently, any platform and strategy implemented on and by AI/NLP/NLU need to remain flexible and open to change. Fundamental concepts such as value-generation provide orientation across time and should form the base of any strategies developed.

Neither the marketplace nor innovation make sense without an underlying crowd of committed actors, which drive the cycles of supply and demand, form the ingredients of cooperation and consulting and are at the heart of creation and innovation. Establishing and fostering this community who will take LT one step further thus forms one of the most important tasks to be addressed by ELG.

2 Innovation

In today's agile, interconnected and virtualised world, the paradigm of open innovation (Chesbrough 2006), connecting many different disciplines, sectors and actors in a non-linear fashion has gained considerable traction. Under this paradigm, innovation takes place within as well as outside an organisation with knowledge flowing in both directions. It allows different actors to collaborate and experiment across organisational boundaries, across different sectors and disciplines, and enables them to dynamically produce innovation in a heterogeneous manner. Eco-systems like ELG form a natural habitat for such activities and a powerful environment for innovation. In this chapter, the concept of innovation is viewed from the angle of open innovation, forming the most appropriate and promising approach for a platform like ELG, rather than the silo'd and closed kind of innovation which is limited to individual organisations. For innovation to occur, two fundamental ingredients need to be combined: innovation = invention + adoption (Schrage 2004). Both of these factors must be present for innovation to take place and to put it into effect in order to generate new knowledge, to develop new products, services or processes. Any environment or innovation-strategy consequently has to reflect both factors, balance efforts and encourage and support both kinds of activities.

2.1 Significance of Innovation

Applications in the fields of AI, NLP or NLU reside in a highly competitive and dynamic landscape. As technology leaps are produced in rapid succession and markets and opportunities expand, organisations can and should make use of internal as well as external ideas and paths to market as they seek to advance their technology (Chesbrough 2006). Justin Rattner, Intel's former CTO evangelised the concept of 21st century industrial research where innovation is driven by teams of boundary

spanners that possess multidisciplinary skills. Online platforms such as ELG provide ideal multi-sided ecosystems for such teams, offering the means to link up and collaborate and to unite a multitude of participants with the joint aim to create novel products and services ready for swift adoption. However, beyond providing the technical framework, resources and tools, such platforms also foster the sharing and exchange of knowledge and ideas between participants. As a result of the increased diversity and connectedness of actors, the generation of genuinely new knowledge and more radical innovation is possible. Whether and to what extent these goals also materialise in practice depends on a variety of factors, such as acceptance and openness to a culture of open innovation that also supports the useful and selective sharing of research results and data. If exercised successfully, open innovation has the potential to eliminate barriers in research and development and generates a dynamic environment that cannot be achieved with traditional methods.

2.2 Types of Innovation and Innovation Strategies

Innovation may span a wide spectrum concerning products, services, methods, business models and even entire organisations. Figure 1 depicts different dimensions and types of innovation and provides several examples for each kind.

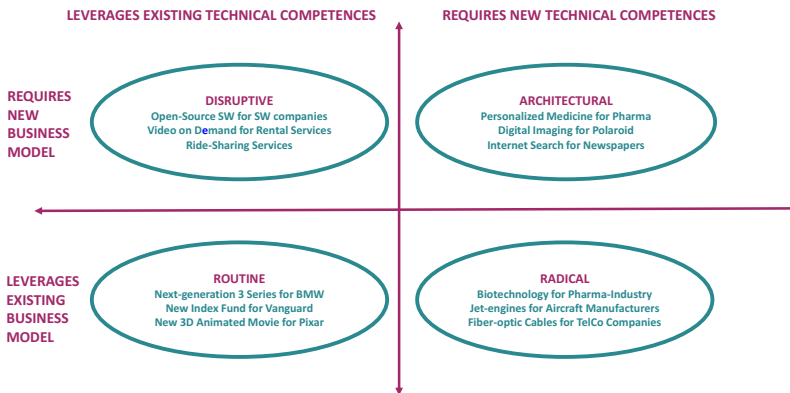


Fig. 1 Innovation landscape (Pisano 2015)

Routine innovation (or incremental innovation) builds on an organisation’s existing technological competences and fits with its existing business model and customer base. Routine innovation aims at improving existing products (or services) continuously until the end of their life-cycles. It typically involves activities to improve features, reduce costs or expand production lines and mechanisms. Architectural innovation combines technological and business model disruptions. Disruptive innovation typically requires a new business model but not necessarily a technological

breakthrough. For that reason, it also challenges, or *disrupts*, the business models of other actors. Breakthrough innovation can be regarded as the more radical version of disruptive innovation causing fundamental changes in the market through the introduction of new products, methods or business models. These categories are not clear-cut and overlap to some extent. However, the dimensions can serve to locate different types of innovation when designing an innovation strategy. Aside from these categories, innovation can also be characterised by the kinds and magnitude of impact caused by it.

Any innovation strategy needs to specify how the different types of innovation (as outlined above) fit into the overall business strategy. It must map an organisation's value proposition for the defined markets and at the same time set realistic boundaries. Furthermore, the strategy must be clearly communicated in order to assure a common goal for all participants involved, secure their commitment and to streamline activities between all partners. Innovation for innovation's sake or for generic goals such as "*we need to be innovative*" are neither sufficient nor effective. Pisano (2015) emphasises the importance of these inter-connections by defining the term "innovation strategy" as the "commitment to a set of coherent, mutually reinforcing policies or behaviours aimed at achieving a specific competitive goal, promoting alignment among diverse groups within an organisation, clarifying objectives and priorities, helping focus efforts around them and specifying how various functions will support it". Innovation – and an innovation strategy – can neither be developed nor executed in isolation, but need to be carried out in sync with the defined business strategies of an organisation to be successful.

2.3 Open Innovation in the ELG Platform and Marketplace

Innovation does not take place in a vacuum, but is tightly connected to the vision, business, marketplace and sustainability strategies aiming to establish and sustain ELG as the primary marketplace for LT in Europe. The platform and community are positioned at the centre around which these different strategies are aligned, supporting each other in the overall goal as depicted in Figure 2.

ELG is a multi-sided and integrated platform and envisioned to function as an innovation driver during the lifetime of the project as well as beyond. The platform itself is complemented by a vibrant and active community of users and stakeholders. These are a key ingredient in creating the critical mass required to make ELG an established marketplace. Building and strengthening this community consequently forms an essential element of the ELG innovation and communication strategies.

Placing the platform and community at the core allows us to adopt an open and collaborative approach to innovation, which needs to become an inherent element (a process) of ELG. The principles of Open Innovation as coined by Chesbrough (2006) form the over-arching theme of this continuous process. Figure 3 provides a schematic overview of the actors and interactions which need to be aligned for innovation and value creation. It is imperative that all groups are present and participate

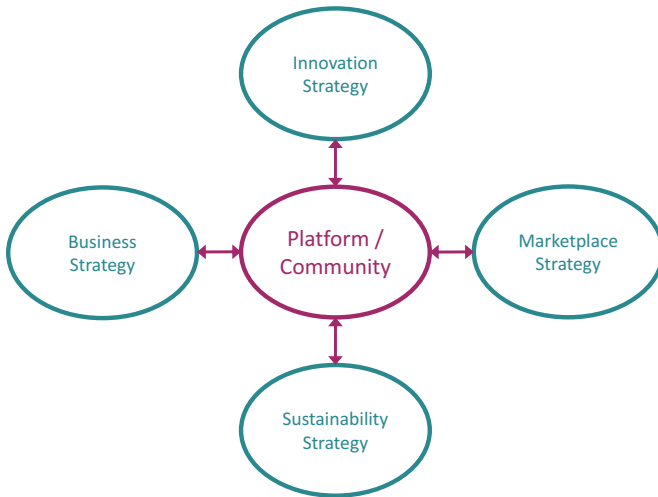


Fig. 2 Strategies centred around the ELG platform and community

actively in the process. To attract and motivate these groups, targeted communication is required.

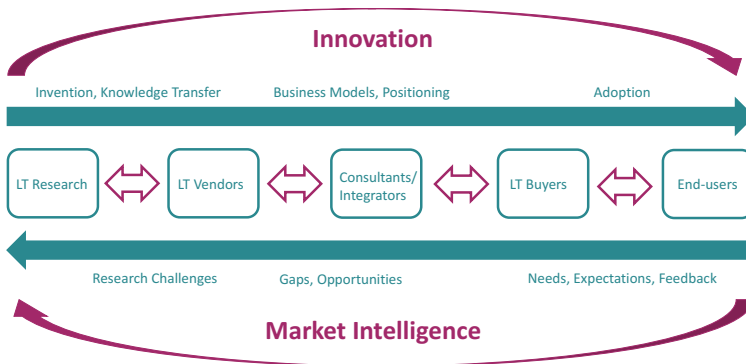


Fig. 3 ELG innovation cycle

In line with the overall approach of ELG, in Figure 3 the process of innovation spans the complete set of activities and actors from invention to adoption. The goal to generate value within the scope of the business model forms the central element. Continuous feedback regarding the needs, gaps, expectations and opportunities is collected via the community, leading to further cycles, which need to be carried out repeatedly and continuously. As a result of the continuous feedback mechanism, strategies can be updated and the speed of adoption increased over time, hence al-

lowing for more rapid cycles of innovation. Figure 4 shows four main dimensions and associated issues to be addressed and considered regarding innovation in ELG.

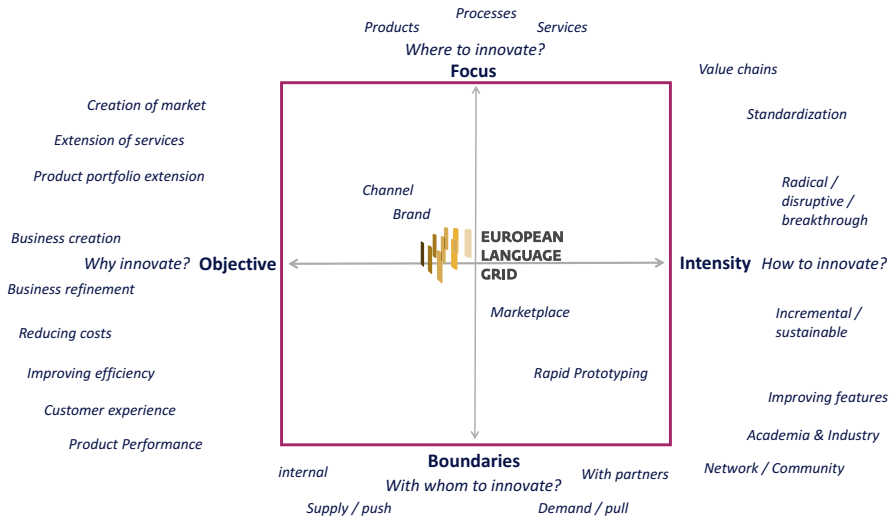


Fig. 4 Dimensions of innovation

For each dimension, several possible approaches are outlined. Together, they form a portfolio of possibilities and opportunities which need to be monitored continuously. Depending on the evolution of ELG, they may need to be adapted to changing conditions and (re-)prioritised. The innovation cycle shown in Figure 3 forms the blueprint for these continuous activities.

For the duration of the ELG project the most important element of innovation is the creation of ELG itself. The use of a platform in the scope of LT as a multi-sided marketplace, allowing participants to create value together by interacting with each other represents an innovative business model (Still et al. 2017). Beyond the platform itself, the creation of products (Section 2.3.1) and services (Section 2.3.2) form two further promising alleys for innovation activities.

2.3.1 Products

ELG provides a large set of technological components and resources which provide a broad basis for product offerings as individual products or product bundles. In terms of innovation potential, both bundles as well as individually improved and adapted LTs provide a wide range of opportunities. Different setups of where services are hosted and run are provided by ELG to optimise resource usage and adapt to the particular needs of customers. An extensive catalogue of tools and resources provides a single point of entry and access to these tools and LTs.

2.3.2 Services

Two kinds of services are provided by ELG: services in the sense of running components (technological services) and services in the sense of experts providing their expertise (human services). In terms of the former, the services can be used individually or in combination (as chains of services) to create value-chains. Combination and composition allow us to establish more complex workflows, enabling end-users to benefit from the capabilities of individual providers without having to worry about any inner workings or being locked in the products of an individual supplier. Corresponding mechanisms regarding billing, licensing and support will provide a single point of contact for customers. Regarding the latter, ELG provides a virtual agora, a business-space for connecting stakeholders developing or deploying (complex) solutions which require skills beyond that of individual actors. This includes services of consultants and integrators who are crucial elements in broadening the adoption (and hence boosting innovation) of LT. They are expected to act as enablers and multipliers for putting LT into practice, supporting their introduction into organisational as well as business processes.

2.3.3 Further Aspects of Innovation

Regarding the *intensity of innovation*, ELG is expected to mainly operate on a level of incremental, continuous innovation, improving existing features and extending the portfolio of features. Through this continuous extension, new combinations of services and products are expected to become available over time which allow the implementation of new features. Linking different services and thus producing value chains in a simple and transparent manner will allow for increased experimentation and thus for an agile environment for the creation of new features. Regarding the *boundaries of innovation*, ELG will focus on the community and stakeholders present on the platform. A catalogue of resources (services, corpora, datasets etc.) as well as of LT experts, consultants and integrators provides a prime resource for locating crucial resources for business. The strength, weight and activity of the community is one of the determining factors for the overall success and adoption of the ELG and hence one of the gate factors for innovation. Regarding the *objective of innovation*, the refinement as well as creation of business form viable alleys. The above-mentioned manner of gradual and incremental innovation lends itself to various kinds of business refinement such as reducing costs, improving the efficiency or product performance and improving customer experience.

Business creation may take place via the platform and community and through the creation of novel services or products via the combination of building blocks offered by ELG. The creation of standards for resources, processing services and interfaces can play an important role as it effectively decouples individual components and vendors. In combination with the technical environment of ELG, this enables increased resilience, scalability, composability and replaceability of components, avoiding vendor lock-in situations. Furthermore, standardisation of these ele-

ments will allow for a higher level of experimentation and show-casing and lower the risk of failure in the development of innovative solutions.

3 Multi-sided Marketplace Approach

To date, there is no general digital umbrella platform for LT in Europe. The ELG platform is designed to fill this gap: it is envisioned to serve as the comprehensive virtual marketplace, where value is created for all its members in Europe and beyond. Based on a multi-sided marketplace approach (see Figure 5), ELG will facilitate value and business creation and efficient transactions coupled with large developer ecosystems that build innovative technologies and services on top of a digital platform in an open and agile manner. The advantage of this approach lies in the nature of multi-sided marketplaces as enablers of transactions driving positive network externalities. They make it easier and more efficient for the participants from diverse markets to interact with each other, as the friction between different contact points is reduced. In addition, these interactions increase the value created together which almost comes naturally due to the network effects. A platform becomes more attractive to potential new users the more users meet and interact on it. In other words, value increases for all participants when more users actively use the platform (Sánchez-Cartas and León 2021). As a marketplace, ELG is designed to make it easy and efficient for participants to connect and exchange ideas and products. These can be as diverse as language resources, technologies, services, components, expertise, innovation or even information. The distinctive feature of the multi-sided approach is that the marketplace enables direct interactions between two or more sides, who can be both – product suppliers and demanders at the same time. In other words, value creation is two-way and continuous.

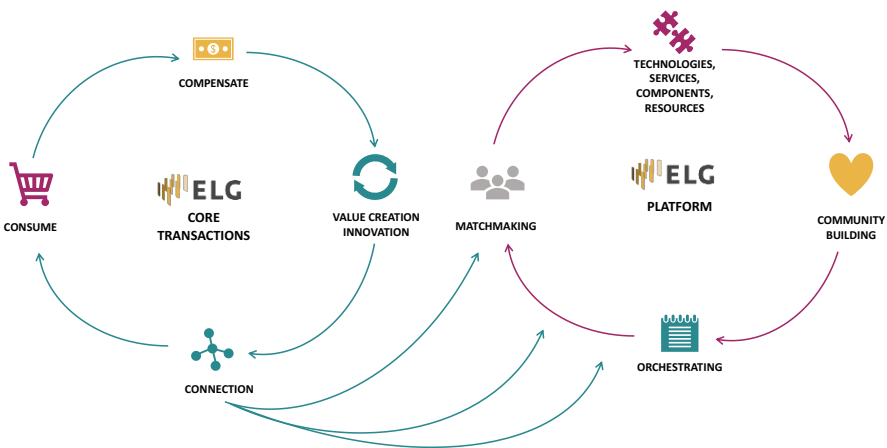


Fig. 5 ELG multi-sided marketplace approach

The core transactions of the multi-sided marketplace are represented by the left part in Figure 5 and are mainly concerned with creating value, establishing connections between supply and demand, and facilitating consumption and compensation of the products (technologies, services, components and resources) offered by ELG. *Connection* is a complex mechanism consisting of the elements portrayed in the right half of Figure 5. Various kinds of connections are supported and promoted by the platform, from matchmaking, to matching of technologies, resources and services vertically and horizontally in order to provide a more comprehensive offering, to orchestrating all interactions between, users, providers and innovators, as well as nurturing a vibrant and active community. The multi-sided marketplace approach encompasses the following principles.

Value Creation ELG aims to be a platform for value creation which will be achieved by facilitating reciprocal exchanges between multiple marketplace participants. In addition, participants can create value by tapping into resources and capacities that they do not have to own. Any resource exchange handled via ELG will reduce transaction costs for each participant and enables access to externalised innovation. The cornerstone of the ELG marketplace positioning is the value it provides to its participants. As *the* European marketplace for LT, it connects previously unmatched supply-side and demand-side participants through innovative forms of value creation, capture and delivery. The value proposition depends on the components and services, their uniqueness, and the means of delivering value to target groups as well as on the right balance between the perceived value and the set price. Furthermore, ELG is the orchestrator to ensure value creation and high quality of participation on the platform. As such, the unique positioning as a marketplace will be based on the value generated and offered across verticals (see Figure 6). For example, a particular buyer receives a vertically packaged LT solution for their desired domain (e. g., the health industry) in the form of a unique combination of components and services from ELG. In addition, they can select the languages for the desired technologies, services and resources for the particular domain.

Connection, Gravity and Flow Whereas traditional offline marketplaces tend to push products and technologies to the market, ELG will rather create a pull-effect. As a multi-sided marketplace it will be equipped to create network effects, i. e., effects that attract new users to enter the marketplace to be part of an ever-growing number of partners who are also part of the network. Together they engage in a mutual value exchange process which is orchestrated by the marketplace. ELG will enable easy access, meaning that participants can easily plug into the platform to share, transact and *connect*. ELG will function like a magnet in creating a pull that attracts participants to the platform with its *gravity*. Because it is both, a transaction and innovation platform, both LT providers and LT users (supply and demand) will be present to achieve critical mass. The *flow* of value will be fostered by matchmaking, i. e., making connections between LT providers and LT users. Rich data will be used for successful matchmaking and the co-creation of value.

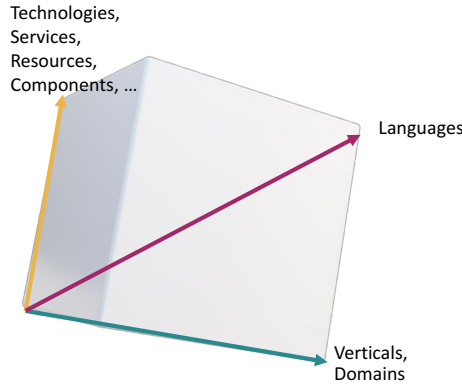


Fig. 6 Value dimensions of the marketplace

Compound Growth The marketplace aims at providing its participants a broad base that enables compound growth and scaling. Growth will be mainly driven by the network effects described above.

Visibility ELG is designed to enhance the visibility of each of its participants, extending their reach and networking power. From the LT vendor perspective the main interest is to acquire customers. As an umbrella platform for European LT, the ELG aims at removing geographic boundaries and language barriers, thus fostering the European Digital Single Market.

Community Building A very important aspect of this approach is to attract, grow and nurture a vibrant and active community around ELG thus promoting an interactive marketplace. The stakeholders include LT providers, academic research organisations, LT customers, EU institutions, public administrations, NGOs, policy makers, project consortia, research projects, as well as the ELG National Competence Centres (NCCs) in 32 European countries. This critical mass of active participants also generates the necessary market pull: an excellent case in point for this are the several pilot projects funded by ELG (see the chapters in Part IV), e. g., Lingsoft, Inc., Coreon GmbH and Elhuyar, among many others, have successfully enhanced the attractiveness of the marketplace by contributing highly demanded services, technologies and languages to the platform.

3.1 Foundations for a Successful Marketplace

What are the key ingredients for a successful marketplace? The answer is not straightforward because the formation and growth of marketplaces depends on many factors such as the availability of capital, sufficient demand, talent, legal situation, tax systems, the innovation and startup culture of a country and many more. Nonetheless, there are certain elements successful marketplaces have in common which are equally important for ELG.

Attraction Indisputably, success can only be achieved if enough participants are attracted to join the ecosystem. This *gravity*, which is one of the most important ingredients, will be supported by a well-balanced interplay of supply and demand all of which will be governed by ELG. It is vital for the marketplace to generate a market pull in order to fulfil the goals of self-sustainability. The more participants the marketplace attracts, the greater will be the network effect and compound value growth (a critical mass has to be reached, cf. Bonchek and Choudary 2013). The technical foundation to ensure that people are attracted to ELG is an innovative and state-of-the-art solution for containerised LT components, services and resources coupled with cloud solutions to enable fast and efficient interaction and speedy and scalable innovation.

Demand Economies of Scale ELG will also rely on demand economies of scale, which take advantage of technological improvements on the demand side and are driven by demand aggregation, efficiencies in networks, and other phenomena (like crowd sourcing of software development) that make bigger networks more valuable to their users (Osterwalder and Pigneur 2010). Once the gravity of the marketplace is functioning, network effects will be the natural result. Growth via network effects leads to market expansion. New buyers enter the marketplace, attracted to ELG by the growing number of partners who are part of the network.

Time-to-Market Strategically speaking, ELG will also focus on reduced time-to-market objectives: the corporate strategy of the future marketplace will be designed to truly fulfill the role as accelerator for business creation and will consider concepts like “lean management” and “just-in-time” supply chain delivery. Furthermore, the agile environment will provide a flexible test-bed for trying out new technologies and approaches.

Quality Standards In order to be successful, the marketplace needs to facilitate the exchange of value which means that the components, services, resources provided through ELG require certain quality standards. In order to safeguard the quality of products (technologies, services, resources and components) provided, ELG standards and quality seals will eventually be implemented. In any case, the provision of high-quality state of the art LT, open architecture, reusable software, industry-grade robust components provide key ingredients for establishing confidence and trust in ELG as a whole. In addition, trust in the marketplace will be created through transparent product offering and by providing feedback and reviews of participants concerning their prior transactions.

Orchestration Furthermore, a proper organisation and infrastructure have to be provided to guarantee that the platform smoothly works as enabler of transactions: ideally, the whole setup fosters the exchange and creation of value and supports doing business in an easy and smooth manner. A prerequisite for this is an attractive, simple and transparent licensing and pricing model, and a simple business processing scheme (Täuscher and Laudien 2018).

Ecosystem of Participants Successful ecosystems have the ability to provide for *coopetition* (competition and cooperation) and value co-creation, which are ideally governed by structure and orchestration to work best. ELG will provide for the ideal environment to foster the structured creation and well-coordinated

growth of the ecosystem. This principle is also reflected in the paradigm of open innovation adopted and encouraged by ELG.

3.2 ELG Ecosystem of Participants

One of the most important ingredients for a sustainable and successful marketplace rely on the ability of ELG to create, nurture and grow an ecosystem of participants. ELG is in the process of expanding and sustaining a unique ecosystem by attracting diverse stakeholder groups holding different roles – reaching from LT suppliers and demanders to networks and associations, industry members and academia, as well as policy makers and national competence centers (see Figure 7). By aligning itself with key associations and initiatives, ELG aims at establishing itself as a central element in a platform-of-platforms landscape.

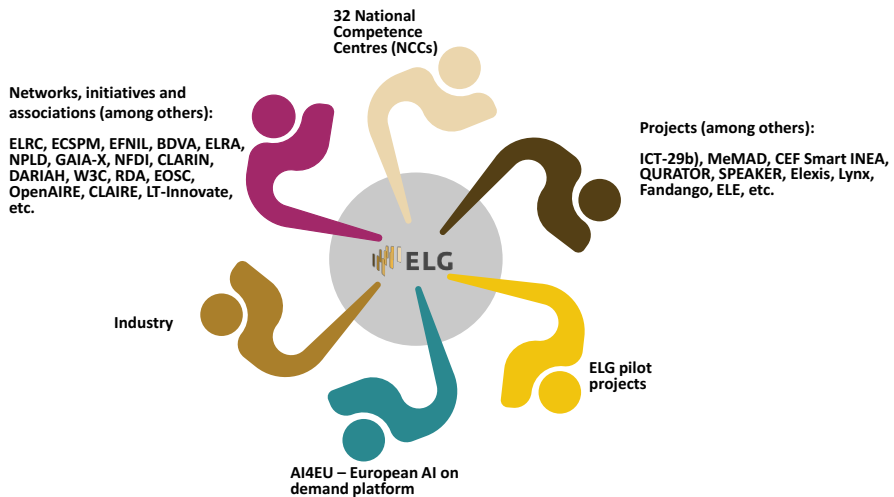


Fig. 7 ELG ecosystem of participants

The ecosystem is designed to connect people, foster an environment for open and two-way communication, create mutually beneficial relationships, and promote community building. In short, it is there to provide an umbrella platform for its participants enabling them to build relationships and to provide value to one another. The role of community building is very important because it is the driver of the marketplace. It is needed in order to reach a critical mass of active participants which eventually generate the intended market pull. From a business perspective, ELG will provide the infrastructure for an ecosystem allowing to match products, services, providers (supply) and users (demand), within a multi-sided setup. By orchestrating different stakeholders’ needs, the ecosystem will allow for matchmaking of demand

and supply and the continuous multi-directional exchange of values. The technological and organisational infrastructure for this matchmaking as well as the interaction governance principles are key building blocks of ELG.

3.3 Technical and Practical Aspects

From a technical perspective, ELG will be the first large-scale LT platform applying containerisation through Kubernetes. This choice and combination of technologies provides a scalable environment with a web user interface and corresponding back-end components and REST APIs. During the course of the project and beyond, it will provide access to a multitude of state-of-the-art technologies, services and components. Furthermore, it will include an overarching LT directory of stakeholders from research, innovation and technology, i. e., it will be the “yellow pages” or the “who’s who” of the European Language Technology community.

On the provider side, ELG adheres to a number of standards in order to facilitate the integration of a large number of disparate tools:

1. Definition of common APIs for each class of tool, designed to be powerful enough to support the necessary use cases but lightweight and flexible enough to allow tools to expose their own specific parameters where this makes sense.
2. Containerisation to isolate tools from one another and to allow each tool to manage its own software dependencies. ELG uses the well-established Kubernetes system to manage the deployment, scaling and execution of containers in combination with Knative to handle auto-scaling of containers on demand.
3. Orchestration of services will become an important topic as the set of offered services grows and the demand for complex workflows becomes visible. This may potentially even concern workflows spanning multiple platforms.

With regard to the user interface, standards in user friendliness are adopted and marketplace-related features, such as upload/download, licensing, billing, payment as well as transparent pricing models will be used. In addition, ELG will promote direct contact to its participants which is important to create additional transparency and trust in the platform.

4 Conclusions

ELG has set its goal to become the *primary platform for Language Technologies in Europe* which incorporates many aspects in one setting: marketplace, business space and a scalable environment for innovation. With regard to innovation, an open innovation approach is adopted, putting the combination of creation and adoption at the centre. Different kinds and granularities of innovation (step-wise and gradual to disruptive) are enabled by ELG and the way the community behind it is set up

and managed. Innovation, however, is not viewed in isolation but rather as a crucial element within the larger context of the ELG business model. The marketplace will focus on commercial aspects and communities, linking supply and demand and enabling reciprocal value exchange. In addition, ELG will form a business space and innovation platform in the sense of becoming a virtual agora, bringing researchers, experts, end-users, requirements and capabilities together in one forum. Moreover, it will serve as a promoter for open innovation, providing access to (external and internal) resources and ingredients for innovation. As *the umbrella platform* shared by the whole European LT community, it will support the bundling of efforts and forces and facilitate the reciprocal transaction of values for all participants to grow and benefit from this scaling.

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