

# Tools and Brokers: Implementing the Innovation Ecosystem at KLM Royal Dutch Airlines

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# Executive Summary

KLM is the flag carrier and biggest airline in the Netherlands. The contribution to climate change of the airline industry requires urgent changes in innovation to be sustainable. At the organisation, innovation is multidisciplinary, and needs of cross-divisional activity. The innovation team is the team responsible for overseeing the innovation processes that actually take place in the different divisions.

In 2019, the innovation team started to be aware of the opportunity of innovating as an 'ecosystem', with frequent transfers of knowledge and cross-divisional synergies. After several efforts, the assignment of this thesis stated the need for a digital product that can interactively represent the actors involved in the different ecosystems within the company. The assignment came with an implicit set of assumptions and a research phase followed to provide better understanding of the context of the assignment.

A number of insights were gathered as a result of the research phase. First, it is not only understandable but imperative for organisations to innovate in networks given the competitiveness and complexity of the current business environment. Second, employees at the organisation, as a result of the activity of the industry, are partially focused on execution and barriers among departments have raised. Third, the culture at the organisation shows formality and structure, valuing efficiency and with productivity residing in the individual and in the respective department.

If the innovation ecosystem concept is to be supported by the innovation team, efforts should address the inefficiency of lateral collaboration. Moreover, the efforts should influence the different areas of the organisation, such as the shared values, systems or staff. Apart from the insights gathered from the research phase, this thesis developed a set of practical interventions that aim to foster collaboration while facilitating the implementation of the innovation ecosystem.

The first intervention comes after the redefinition of the original assignment. Designing a tool that represents the actors can help, but only if matched with interventions in other areas. After an iterative design process, a tool that allows the actors within an ecosystem to see others' involvement was built using Power BI. The second intervention required a reorganisation of the knowledge-management system used for innovation. The intervention provided a new information architecture and layout for knowledge to be easily retrieved, and presumably collaboration within the ecosystem fostered. Finally, the last intervention identified a set of cultural brokers who can connect groups of employees with an innovation purpose. Studies on social networks and innovation show the brokers own a competitive advantage within the networks: they are more creative and can help bridge structural holes. Brokers can be nurtured when a cross-divisional need exists and the innovation requires to close the gap.

Finally, after developing the interventions, the innovation team is recommended to define the governance of the ecosystems in place. Defining governance will help align expectations towards collaboration and knowledge sharing from the stakeholders involved, and is a first crucial step before continuing with implementation efforts after the thesis. Once governance is defined, the organisation is provided with guidance on how to continue with implementation tasks, by starting a pilot project and including a manual of the designed tool to assist users during their learning.

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# 1. Introduction

The report starts by presenting the context, methods and approach of the project. First, a brief description of the organisation where the project takes place and how innovation is carried out are described. Innovation is argued to be key for the future of the industry and company. Afterwards, the role of the innovation team responsible for proposing the assignment at the organisation is explained. The chapter ends by explaining the overarching approach to the initial assignment, outlining the structure and methods used during the thesis.



## 1.1 KLM Royal Dutch Airlines

KLM is the oldest airline in the world operating under its original name. KLM was born in October 1919, founded by eight Dutch businessmen (KLM Royal Dutch Airlines, 2022). Albert Plesman is the most recognisable figure from those early years, an aviator lieutenant who became the first managing director (KLM Royal Dutch Airlines, 2022). KLM is the flag carrier airline of the Netherlands, with its main hub located at the airport of Amsterdam Schiphol. An overview of important metrics of the airline is given in Table 1.

Table 1. Company overview.

KLM Royal Dutch Airlines	
Origin	1919
Hub	Airport Amsterdam Schiphol
Businesses	Passenger, Cargo, and Engineering & Maintenance
Revenue	6065 M (euros, 2022)
Number of Aircraft	110
Destinations	162 worldwide (92 European)
Partnerships	<ul style="list-style-type: none"><li>- Trans-Atlantic: Air France, Delta, Alitalia</li><li>- Africa: Kenya Airways</li><li>- China: China Southern Airlines, Xiamen Airlines, and China Eastern Airlines</li></ul>

Source: KLM Corporate (2022)

In 2004 KLM, flag carrier of the Netherlands, merged with Air France, flag carrier of France, to form the Air France-KLM group. The combination of the two carriers was important for the consolidation of the airline industry, and created the largest airline group in the world by turnover (Air France-KLM, 2004). The merger helped the airlines to be more efficient and an estimate of half a billion euros as savings has been disclosed (Air France-KLM, 2004). The brands remained separate and independent from each other to preserve their heritage and identity towards customers. The group runs three core businesses: passengers, cargo, and maintenance. The passenger business is the most renowned, flying people between destinations; the cargo business performs similarly but with packages; while the maintenance business repairs aircraft for their own and other carriers' fleet.

KLM has the ambition to become Europe's most customer oriented, efficient, and innovative network carrier. The company's current strategy is built around pioneering sustainable aviation, with three pillars of transformation towards a net-positive company, creation of technological advancement and running of a great airline for their customers (KLM Royal Dutch Airlines, 2022). On top of that, the airline also shows its commitment to the broader society with a wide set of initiatives and partnerships. KLM has been acknowledged as a world air transport leader by the Dow Jones Sustainability Index (Air France-KLM, 2019).

During the last hundred years KLM has seen several wars and events affect its operations and health of the business. The covid pandemic hit to the airline industry is the biggest the company has seen throughout its history. Destinations in quarantine, flight bans, and idle aircraft meant the financial statements of the company had to postpone operating profits. Furthermore, the costs the airline incurred during daily operations meant the Dutch government had to intervene. The intervention imposed certain conditions such as financial restructurings and sustainability commitments for the near future of the airline.



## 1.2 Innovation at KLM Royal Dutch Airlines

The role of the Dutch state together with the current stage of the industry show the necessity and importance of innovation at KLM. Decreased financial health imposes wiser resource allocation into new projects (KLM, 2022b). On top of that, the industry is receiving wide criticism for its contribution to air pollution and climate change (Gayle, 2022). Airlines will have to innovate to see their emissions cut down with efficient technology, and KLM aims to take a pioneering role in sustainable aviation (KLM, 2022a). Changes and new solutions to current problems are necessary for the future of the company.

In the past, KLM has been able to improve both its operations and value proposition to the customer with innovation. Innovation has facilitated running lower budgets or better experiences as a result of implementation. The following paragraphs briefly describe three successful innovation cases at the company:

**New training method for pilots using virtual reality (VR).** Pilots undergo costly and time-consuming trainings. In an effort to complement the regular trainings of the pilots, a team of developers looked into how to use VR to make trainings more accessible and site independent. The outcome of the team's efforts (Figure 1) has helped KLM to save time and budget in training the pilots (KLM Royal Dutch Airlines, 2020). Sebastian Gerken, Senior Instructor Embraer at KLM Cityhopper says:



Figure 1. Snapshot of VR cockpit environment

*"VR allows pilots to familiarise themselves with the cockpit in advance, so that they make more effective use of their simulator time."*

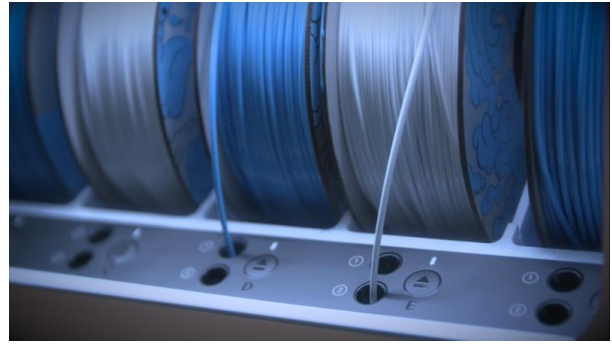
(KLM Royal Dutch Airlines, 2020, para. 2)

Source: KLM Royal Dutch Airlines (2020)

**Tools for maintenance made out of recycled PET.** Expensive material is used when KLM's Engineering & Maintenance employees check and repair the aircraft. An example of these are the special plugs used to cover rim holes when painting, or protective tape that is used during maintenance of turbine blades (Figure 2). Fortunately, additive manufacturing can build precise tooling aids without requiring expensive plugs or raw materials. Additionally, now cheaper and recycled materials are used as filament for the 3D printers. KLM is able to recycle PET bottles from its own flights to make filament (KLM Royal Dutch Airlines, 2019b). Additive manufacturing and PET recycling now save time and budget during maintenance. The innovation required the skills from experts in a new technology, the experience of the maintenance teams, and the input from cabin and inflight services for the material to make the filament.



Figure 2. 3d printed tool and filament for turbine blades



Source: KLM Royal Dutch Airlines (2019b)

**Reducing waste by recycling catering supplies.** A flight test was carried out in which a newly designed, lighter, and recyclable tray was used. The materials of the components of this tray were not only lighter but were recycled following a closed loop complying with hygienic standards (KLM Royal Dutch Airlines, 2019a). This initiative is to be the steppingstone to other closed-loop products during flights to reduce waste. The innovation required the combined efforts of the cabin crew team, the food supplier and the catering materials supplier.



Figure 3. The first circular recycled tray



Source: KLM Royal Dutch Airlines (2019a)

These examples show how KLM has been able to implement new technologies and closed loop systems with new materials. Some of these innovations have the opportunity to be implemented cross-divisionally. In the case of VR, given the capability to immerse users in a different environment, it now helps pilots familiarise themselves with the cockpit in advance. Fortunately, the example of the pilots is only one of the many use cases VR can find at the organisation. Pilot projects now exist in which VR is used to train cabin crew, and the possibility of using VR to explore a future holiday destination prior booking a flight is also being explored. Similarly, additive manufacturing helps in decreasing waste from maintenance tooling aids such as plugs and tapes and is being explored in other areas of the organisation.

Certain employees and departments at KLM have now knowledge in key technologies which could find a new value proposition for the business in the future. The challenge is how to bring the knowledge across the business units, and here the role of a central innovation management team is key (Tidd & Bessant, 2010). Mintzberg, in his studies of structural archetypes, identified a set of challenges in innovation for those organisations who operate in a divisionalised form. The challenges are knowledge sharing and friction between divisions (1979).

The challenge for the organisation is to be innovative to pioneer sustainable aviation (KLM, 2022b). For the ones involved in 'innovation' within the company, the challenge is how to bring novel

changes that help in that direction, and avoid reinventing the wheel if a technology or innovation can find several use cases across divisions. The context this thesis starts from is therefore the situation of the airline industry and the necessity to be innovative in such situation, in a cross-divisional manner. The cross-divisional perspective requires from the effort of a central team to overcome those challenges. The team has started with a direction to overcome such challenges. The next section outlines what the exact role of the innovation management team at KLM is, what direction has been established, and how the assignment for this project was proposed.

## 1.3 The innovation team, assignment and methods

The Transformation Office (TO) is the driving force behind the transformation of KLM towards a more sustainable and innovative company. The TO includes the *Strategy* team, the *Engagement* team, and the *Innovation* team, which proposed the assignment. The innovation team has three main functions within the business (Arlette vd. Veer, personal communication, May 26, 2022). The three pillars below are presented with an example of a task carried out within the pillar. The example does not exclude other tasks from the pillar.

**Enable.** The team plans training and leadership sessions to practitioners in the business about innovation and design thinking methodologies.

**Connect.** The team helps in establishing connections both internally and externally with partners needed to bring an innovation from idea to implementation.

**Strategize.** The team co-creates local innovation strategies with the business units, assisting them in defining the strategy and innovation targets.

Within the 'connect' pillar lies the 'innovation ecosystem' concept. An innovation ecosystem is "the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution" (Adner, 2006, p. 2). Granstrand & Hogersson synthesised it as "the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors" (Granstrand & Hogersson, 2020, p. 3).

The innovation ecosystem concept started to be developed at KLM in 2019. The innovation ecosystem at KLM includes an internal and external network of actors (e.g., partners, collaborators, departments) which collaborate to bring an innovation from idea to implementation. Ecosystems are created on the base of topics or projects that are strategically important for the organisation.

### 1.3.1 Situation, complication, and assignment

After several implementation efforts, the current objective of the innovation team is to create updated representations of the actors involved in a certain ecosystem. When these representations are shared within the company, they are assumed to help in achieving what can be termed as 'ecosystem goals': driving ecosystem thinking, avoiding silo mentality and fostering transfers of knowledge between the stakeholders involved.

Representations nowadays are drafted manually as shown in Figure 4, and it becomes a challenge when updating or sharing the ecosystem with the stakeholders (Arlette vd. Veer, personal communication, Jan 31, 2022). Moreover, the creation of ecosystems is decentralised, which means that each key stakeholder can create their own representation. The result has been a lack of guidance and compliance in creating visualisations of the ecosystems. The innovation team needs a better process to represent innovation ecosystems and facilitate sharing throughout the organisation.

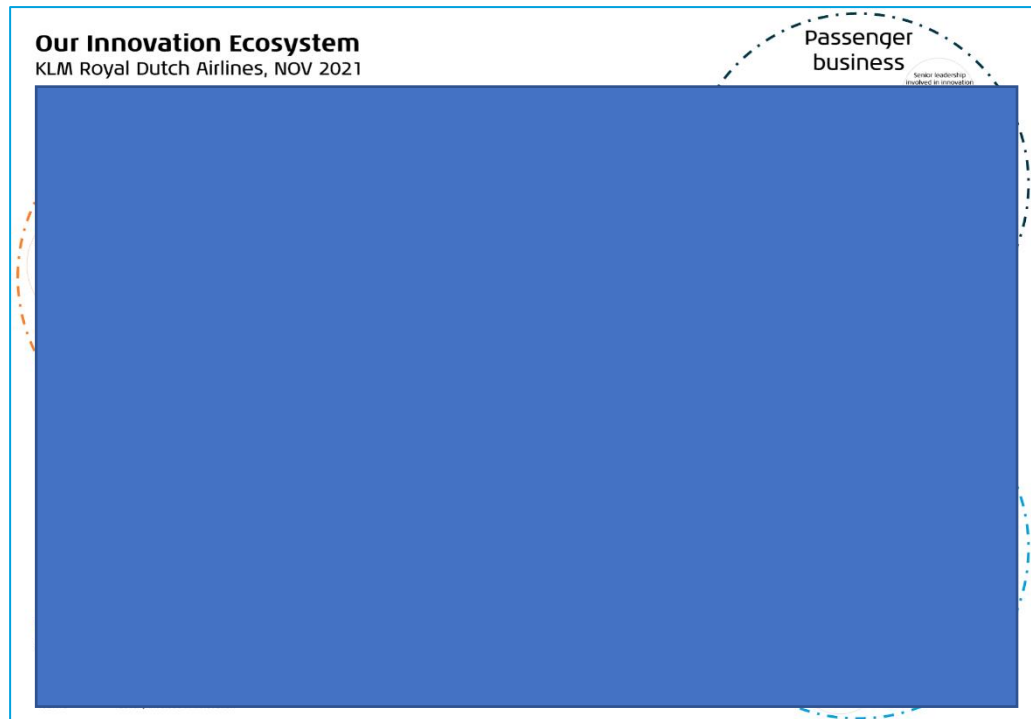


Figure 4. Current ecosystem representation

The assignment initially proposed by the innovation team can be briefly described as ‘to design a (digital) product that creates representations of actors involved in a certain innovation ecosystem’. The given assignment had an implicit set of assumptions. The product was assumed to be the actual solution of what is needed to accomplish the ecosystem goals mentioned above, or the fact that digital technologies are the suitable to represent and share a visualisation of the ecosystem, among others.

### 1.3.2 Research phase and methods

To reach a profound understanding of the context of the assignment an analytical research phase followed. Before conducting the actual research, during the kick-off meeting and discussions with the supervisory team, three research questions were phrased for further investigation. The following paragraphs explain the decisions and arguments made in favour of these three directions.

First, an understanding of the origin and implications of innovation in networks was needed. The concept of innovation ecosystems is rooted into the modern models of networking in innovation. The aim of this first direction was to understand why the innovation management literature has reached this stage, and what the advantages of adopting such model and mindset in innovation are at large organisations. These first area of research provided the theoretical foundations and a literature review was conducted on the topic. Given the short timeframe of the project, books and renowned articles from popular authors were prioritised as sources of the review. The research question phrased was:

1. Why should organisations consider innovating in networks?

Second, the opinion and perspectives of employees in the organisation was necessary to understand how to effectively propose a solution or intervention that influences how they innovate. Since the employees would be the final users of anything proposed, or affected by the implementation, their perspective was researched to find common opportunities or barriers they see with regard to the innovation ecosystem. By conducting seven semi-structured interviews with a varied sample of employees, the second research question (with a set of limitations) was answered:

## 2. What do employees think about the concept and implementation of the innovation ecosystem?

Finally, a holistic perspective of the culture of the organisation was needed. After discussions with the supervisory team, a not yet understandable relationship between the culture of an organisation and how that organisation performs in innovation was acknowledged. The goal was to briefly describe culture at KLM and state, with the limitations of the research, how KLM may perform in innovation. The approach used for giving a brief description was Schein and his learning approach to organisational culture due to the historical background and learning conditioning of the company. Schein provides a framework of three elements to explain culture. By conducting empirical research through observations and insights from previous interviews, the three elements were filled in to describe the company. This final research question aimed to add the holistic and cultural view to the practical insights the employees gave with the second research question:

## 3. Is the organisational culture ready to adopt a new ecosystem/network mindset?

Although providing clarity and answering the research questions is one of the main objectives of the thesis, given the organisational context of the assignment the goal is to provide practical interventions that can improve the situation during the project. Stating these three research questions aimed to provide both the theoretical and practical, and holistic and detailed insights, needed to redefine the initial assignment into a problem statement on which to develop interventions during the rest of the project.

### 1.3.3 Development phase and methods

A better understanding of the context of the assignment was reached by answering the research questions. The results showed that broader cross-divisional action and collaboration in different areas of the company is needed to see an effective implementation of the innovation ecosystem. After finalising the analytical research phase, the assignment was reframed as a key question to be answered during the next phase of the thesis.

*How should KLM develop interventions to implement the innovation ecosystem while facilitating cross-divisional collaboration?*

The goal of the development phase was therefore to develop interventions that can help the innovation team in implementing the innovation ecosystem while addressing lateral collaboration among business units and departments. The method to find possible interventions was twofold. On the one hand, after conducting the research it was better understood how the initial assignment fitted within the goals of the project. The method in this case was reframing and redefining the initial assignment to one that suited the outcome of the research.

On the other hand, parallel and complementary interventions were developed. The method to find such interventions was conducting another literature review, this one part of the development phase. This time, it was assumed that finding best-practice cases in similar contexts would provide the best and most modern interventions to be adapted to the current case at KLM. The sources used for finding such best-practice cases and latest thinking were magazines such as the Harvard Business Review and MIT Sloan Management Review. Although these do not form part of the scientific community, they often contain practical business cases and examples of situations at large organisations. Practical insights were prioritised and these sources consulted to phrase five additional interventions. The interventions were then judged according to the criteria and constraints of the project to decide which were more suitable to be developed.

Apart from the redefined initial assignment, the last intervention chosen had a basis on social networks and innovation. Conducting complex social network analysis was outside the scope and timeframe of the thesis. Therefore, a novel method that simplifies the process, with limitations but providing accurate results was searched for. The 'NetRep' method helped in finding key individuals which could help in brokering connections at the organisation.

After finalising the development of the three interventions pursued during the project a conclusion follows on the thesis and the role of the proposals to the organisation and the innovation team. The conclusion includes a set of recommendations to define governance to align the stakeholders involved in the innovation ecosystem and how to continue with the implementation of the systems developed.

Finally, the content developed during this thesis is not only meant to be valuable for the innovation team and the company where it takes place, but be applicable to other innovation management teams at large organisations who are experiencing a similar set of challenges, brought by inefficient collaboration and innovation networking ambitions, and can use the findings of the thesis to start their own interventions and drive innovation and collaboration improvements within their companies.

## 1.4 Thesis outline and reader's guide

The thesis is divided into eight chapters that provide both answers to research questions and practical interventions to the complex issue of implementing an innovation ecosystem at a large organisation. A chapter overview is provided in Figure 5. The first chapter gives a brief background of the organisation and assignment. The chapter also describes innovation at the organisation and the structure and methods used during the thesis. An overview of the research questions phrased to gather knowledge and redefine the initial assignment is also given.

Chapter 2 presents the research conducted and answers to these research questions. The research helped in understanding the context, and having the necessary knowledge to state a problem definition with which to continue with the project. This problem is presented in Chapter 3.

Before starting to develop interventions to the problem, Chapter 4 describes the stakeholders involved, as well as the constraints and criteria that limit the solution space during the project. Not every action is possible given the timeframe of the project and this chapter aimed to make that explicit.

Chapter 5 presents the solution development process. Possible actions or interventions to the issue of lateral collaboration in ecosystem implementation are found and judged according to the criteria and constraints of the project. The actual development process of three interventions is presented in Chapters 6, 7 and 8, respectively.

Finally, Chapter 9 includes a conclusion and a set of recommendations for the organisation to continue with after the end of the project. The recommendations aim to continue with the knowledge gathered during the thesis on topics such as tooling, networking and collaboration that can help the innovation team in the future.

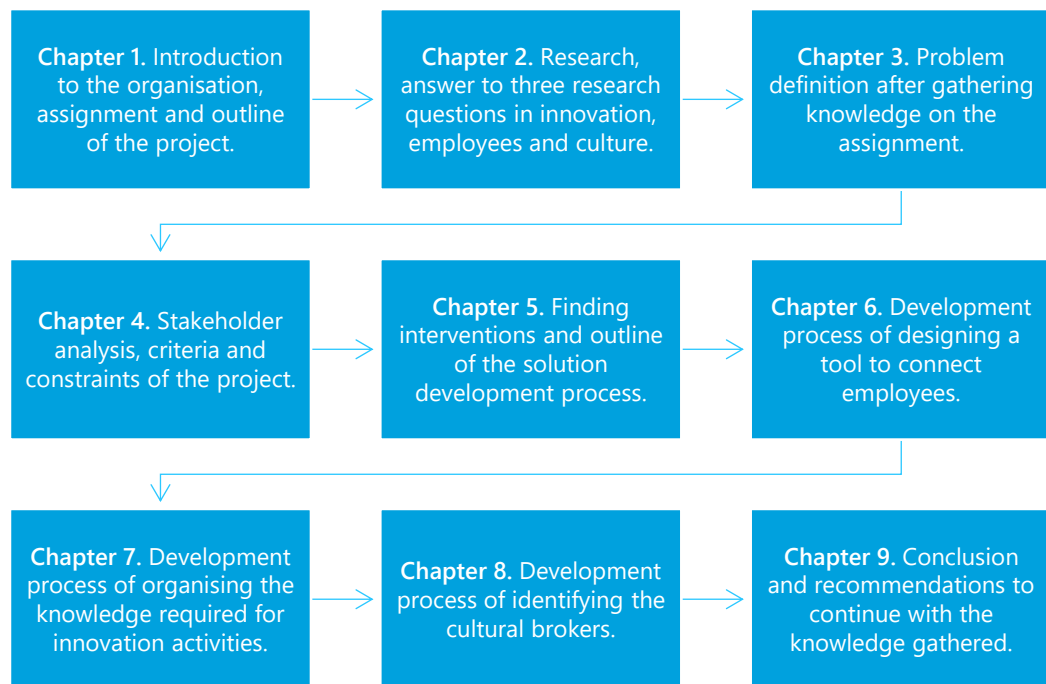


Figure 5. Thesis outline and chapter overview



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## 2. Research

The research questions consider relevant literature findings on the topic of innovation management and networks, employees' opinions and perceptions on the ecosystem concept, and the culture at the organisation. The three research questions are:

- 1. Why should organisations consider innovating in networks?**
- 2. What do employees think about the concept and implementation of the innovation ecosystem?**
- 3. Is the organisational culture ready to adopt a new ecosystem/network mindset?**

In the chapter the questions are answered by reviewing literature and by observing and conducting interviews with key stakeholders of the project.



## 2.1 Innovating in networks?

With this section I present a literature review of innovation networks and where innovation ecosystems lie in today's research in the field of innovation management. Before explaining what an innovation network is and how beneficial they are for corporations carrying out innovation activities, I start by explaining the need for organisations to innovate in the present business environment. From there, I show the evolution of innovation models until the network and ecosystem-type frameworks. Finally, the section ends by giving evidence of how digitalisation can support the implementation of an innovation network.

### There is a need for organisations to innovate

What Schumpeter termed 'creative destruction' has had tremendous implications for organisations to renew themselves to stay competitive (1942). Research has shown a correlation between market performance and innovation with the development of new products and process improvements (Souder & Sherman, 1994; Tidd, 2000). If organisations want to stay alive in the long-term, they must manage innovation consciously and actively (Tidd & Bessant, 2020). The initiative of actively managing innovation has created the need for building models that structure and represent the innovation process (Henderson and Clark, 1990; Christensen & Raynor, 2003). Models are able to represent (although never in a complete manner) the innovation practice that is behind. Changes in innovation practices throughout our history have therefore implied iterations to the models themselves. In the end, the models have changed to represent how innovation has changed.

### From linear to networking models of innovation

In the 60s and 70s the innovation management literature described the process as linear, with the source of innovation coming from one of the two ends of the value chain: either R&D discovering a new technology or application, or a market that signalled the need to propose something new (Dodgson, 2000). These models are linear and were named by the terms *technology push* or *market pull* respectively. The *push* and *pull* models are not representative anymore. Van de Ven et. al showed some of the limitations of the linear models of innovation, such as an inaccurate representation of the sometimes-chaotic nature of the innovation process (2008). Further research has shown that the archetype of an inventor with a breakthrough discovery is not an accurate example either of how the process actually is. Innovation is not about individual discoveries but about multi-actor processes (Tidd & Bessant, 2020). The current complexity of markets and technologies often require several disciplines to create a successful product or process improvement together. Companies use multi-disciplinary teams to engage individuals in new projects. Nowadays the need for external parties is also being recognised. Rothwell (1992) acknowledged in a chronological representation of the generations of innovation models the need for more complex and interactive frameworks that describe the process (Table 2).

Table 2. Five generations of innovation models

Rothwell's five generations of innovation models	
Generation	Characteristics
First and second	Simple linear models – pull and push
Third	Coupling model, recognising iteration and feedback-loops between elements
Fourth	Parallel model, integration within the company of upstream suppliers and downstream customers, emphasis on alliances
Fifth	Systems integration and effective networking, flexible response, continuous innovation

Source: Rothwell (1992)

The first and second models are the classic linear innovation process of push and pull. The third model recognised the need of iterative loops. The fourth added parallel sources in which vertically integrated actors innovate. The fifth generation goes a step further and recognises the need to innovate in networks. Here several actors interact between each other and form relationships that contribute to bringing an innovation to the market. The shift has been from linear to networking models of innovation. Network models give a more accurate representation of how innovation is nowadays (Rothwell, 1992). Organisations are more and more executing innovation processes with the patterns of networking models (Powell et al., 1996).

### There are advantages for innovating in networks

Not only are networks a more accurate representation, but there are advantages for organisations in understanding the value of networks. Innovation networks can include both the analysis of social interactions within a corporation, and the external relationships such as strategic partnerships or joint ventures (Jones et al., 2001). Networks have the advantage of, on the one hand, help in analysing the relationships between actors and assets mobilised in any innovation process and, at the same time, provide a framework to explore the variety of sources within the innovation activity (Jones et al., 2001). Tidd & Bessant suggest four added values of increasing the levels of innovation networking in organisations (Table 3).

Table 3. Arguments for greater levels of innovation networking at organisations

Added values of innovation networking at organisations	
Collective efficiency	Networking allows firms in today's complex environment to achieve together what would be impossible to achieve by themselves
Collective learning	Networking supports the exchange of experiences, successes and failures that can help them to do what others have already done
Collective risk taking	Investing in innovation can be a financially risky activity that, by the effects of networking, can be diversified
Intersection of different knowledge sets	A firm cannot be an expert in everything, and the interrelation with other firms with complementary knowledge can create synergies

Source: Tidd & Bessant, 2020

### The innovation ecosystem rise

The collaborative arrangements of a network are often described by the concept of an ecosystem (Moore, 1993). The origin of the term ecosystem goes back to 1935, when British ecologist Arthur Tansley noted the importance of the transfers that took place between species and the environment (Willis, 1997). An innovation ecosystem can be described as the network of actors that co-create value around a certain innovation topic (Adner & Kapoor, 2016). Research acknowledges the need for a firm to hold responsibility for the ecosystem's purpose (Jacobides et al. 2018). The firm is accountable for ensuring the creation of value among the stakeholders (Clarysse et al. 2014).

### Information technology can support the network

Rothwell's fifth generation described how innovation is or should be carried out nowadays, given the advantages presented by Tidd & Bessant. Innovation is a process that needs connections established between different actors (universities, partners, departments, etc). Nowadays relationships between actors are often enabled by the use of information and communication technologies. The value digitalisation and IT systems have brought to communication and knowledge management mean they are often used to build a tangible representation of the network behind. Research names the representation a virtual network. Virtual innovation networks include the different actors and parties that exchange information via the intranet, extranet or internet to create business value (Pasiante & Andriani, 2000). The mere presence of a virtual platform where to share information allows actors to combine their individual offerings with a common purpose (Dattée et al., 2018). The platforms also allow the building of complementary innovations and can help in generating network effects (Gawer et al., 2014). Virtual innovation networks are therefore a necessary element to support how innovation should be managed and orchestrated nowadays.

### Summary

Organisations have recognised the value of innovation to stay competitive. Innovation practices have changed throughout the course of history. The evolutions seen from linear to networking models of innovation make now clear how firms should innovate. To offer support, the exchange of information via virtual networks or ecosystems can be built by using information and communication technologies.

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## 2.2 What do employees think?

The previous section identified how organisations should model the innovation process nowadays. Given the spectrum of technologies, disruption and possibilities for partnerships that can be found in the present business environment it is recommended to adopt the networking models of innovation.

In this section the second research question is answered with a set of limitations explained at the end: what do employees think about the concept and implementation of the innovation ecosystem? To answer the question I conducted interviews with key stakeholders during the second week of the project. The section presents the method followed, results, discussion and conclusion of the research conducted.

### 2.2.1 Method

Interviews followed a semi-structured format of online conversations of 30 minutes. A group of seven potential participants was recommended by the company mentor that had a broad overview of innovation activities. To ensure the heterogeneity of the sample group, some interviewees had a long track record of innovation projects at the organisation while others recently arrived. The group interviewed included a variety of roles, hierarchies, departments, and business units in the company. A description of the interviewee's role and place in the organisation is shown in Table 4.

Table 4. Interviewees' position and department/division

Job position	Department/division
Change Manager	Sustainability Office
IT Project Manager	IT Technology Office
Head of Strategy	Cargo Business
Management Trainee	Catering Services
Management Trainee	Sustainability Office
Product Owner	Passenger Business
Director of Business Development	Ground Services

Participants were asked questions about their background in the company, prior involvement in innovation activities and their knowledge about the ecosystem concept, among others. The interview guide was flexibly adapted to the knowledge the interviewee had about the innovation ecosystem at KLM and their background. The questions asked during the interviews can be found at Appendix 1.

### 2.2.2 Analysis

All interviews were audio recorded and transcribed. The content of the interviews was analysed manually by reading and reflecting on what each interviewee said and how that related to what others stated to draw general conclusions. The reasoning process was therefore inductive, starting from particular statements and reaching general conclusions.



### 2.2.3 Results and discussion

The findings are categorised into four themes or overarching insights. The themes are about the business activity of the organisation; effort from employees in cross-divisional needs; communication across departments; and the opportunity for establishing new relationships between units with a common purpose.

#### **The activity of KLM relies on execution, not innovation**

Airlines rely on operational activities to be able to carry goods and passengers between origin and destination. Operational activities require focus and improving in an activity's performance over time. KLM's core competency as an airline is operational excellence, which has allowed the organisation to remain competitive as one of the oldest airlines in the world. If we understand the business in which the organisation operates, we can understand that activities that require risk-taking are sometimes discarded or underestimated compared to operational activities. A Head of Strategy interviewed pointed out:

*"The big activity of AFKL is passenger traffic. The core of our activity remains passenger business. [...] The majority of our company, KLM, is focused on execution, not on innovation."*

Focus on execution allows KLM to remain competitive at the expense of innovation. With competition comes growth, and with growth, expansion. The airline has expanded with several divisions to perform the operations mentioned above. A spread geographical distribution increases at the same time the distance between business units.

*"As you know, it's a really big company. With even a lot of different geographical locations. There's a really big gap between departments, [...] and it has a lot to do with that you really don't know who's working on something that's four departments away from you."*

Finally, aside from operational focus and geographically spread units, time has influenced the learning conditioning of a large part of the workforce.

*"There's a lot of people that have been working here for the past 30 or 40 years and done their job the same way for the past 30 or 40 years."*

The activity at KLM is focused on operations, is geographically spread, and has been constant for a long period of time. We can conclude that innovations that require risk-taking, a (geographically) united workforce, and changes in employees' behaviour might be a challenge to achieve without disrupting the activities in which the company operates.

#### **Doubling effort and projects occur with a cross-divisional need**

The insights presented above can explain why overlapping tasks have existed in the past. Operationally driven and focused employees start initiatives but are unaware of what has been done in other parts of the company. In the end, departments compete within the company as competitors compete outside.

*"I know a lot of examples where work was done double because people were not aware of each other. Four years ago I was working with Department A making a data science model. Well, it took a lot of effort and then it turns out that in Department B there was also a team working on the same data. In the end they made almost the same model."*

The name of the departments has been modified to protect the privacy of each team.



Participants stated that asking and figuring out what others have done is not part of employees' behaviour yet. Depending on the initiative, effort, and time put, the issue can vary in relevance for the company.

*"It's not in the DNA of people to reach out directly, there are a lot of double workers. So it will make sometimes things difficult"*

The operationally driven activity results in employees that are not aware of what others are doing. Eventually, it results in double work, and it remains uncertain whether this could happen again and where. Nevertheless, cross-divisional communication exists to a certain extent.

### **Hierarchy and friendship are the method for cross-divisional communication**

Participants were asked about the main methods used by employees to break barriers between departments. At the moment, employees rely on friendship networks to establish new contacts:

*"Because right now we do it a bit more informal. So (for example) there's someone responsible for SAF within the sustainability office, and often people just call her and ask: we need someone who's working on SAF in Cargo, who do I call?"*

Another method for communicating across departments is relying in the direct manager.

*"Most of the requests that come from other departments come from the hierarchical lines, like from my manager."*

These methods of communication help in lowering barriers between departments and enabling sharing of knowledge. It remains uncertain how effective they are. Asking an already known colleague is limited by the network of the colleague. Similarly occurs with the manager, without considering the disturbing effects of such requests.

Such barriers can be detrimental to innovation and to any implementation effort to establish an innovation ecosystem. Markman shows in *How to Create an Innovation Ecosystem*, that a culture that adopts an innovation ecosystem should be one that facilitates connections between employees:

*"Groups involved in innovative projects will reach out to each other directly to solve problems [...] This loosely-coupled structure helps to create a culture of innovation, rather than top-down governance, allowing innovative ideas to not only be formed — but also thrive and grow. (Markman, 2014, p. 2)"*

### **There is an opportunity for establishing new links**

Participants are enthusiastic about the opportunity they see in improving the methods and avoiding the double efforts explained above. Some see the benefit in having value propositions shared, being beneficial for several units but started and developed only once.

*"I think about autonomous vehicles, which [...] is interesting for the baggage departments, but it's also interesting for Cargo and could be interesting for E&M. These links could be established."*

Individuals are sometimes wondering how to learn about new innovations that have been carried out in other corners of the organisation.

*"My personal use case would be I'm looking for somebody in the company that knows everything about exoskeletons. Where can I find that person?"*

Moreover, participants see the benefit in centralising and building an official method to find information about innovation in the company.

*"I think there would be a real big opportunity to create something that actually works on how to find information, how to find people"*

Finally, attempts by the innovation team on prototyping what the initial assignment aimed for have been criticised.

*"But [...] it's not easy to use, it's not complete, I don't think it's updated, and I don't think it's well known throughout the company that it exists."*

Participants see the potential benefit in establishing cross-divisional innovation links, new connections on certain topics such as exoskeletons, and building the platform that facilitates such transfer and interaction.

#### 2.2.4 Conclusion

The perspective of employees in the organisation was necessary to understand how to effectively propose a solution or intervention for them. Since the employees would be the final users of anything proposed, their perspective was researched in this section to find common opportunities or barriers they see with regard to the innovation ecosystem. A small sample of employees was contacted for conducting semi-structured interviews. Although the sample is varied in levels of hierarchy, background, and experience, it is small in number, which may affect the representativeness of the results. Nevertheless, the insights can be considered as input for the project. The organisation's core competency is operational excellence, which has allowed it to remain competitive throughout its history. Employees have learned to focus, units have been built separate from each other, and barriers between departments have raised. The first result of such conditions has been double effort in certain tasks and sometimes ineffective methods of connecting across divisions. Fortunately the participants are enthusiastic about the opportunity of innovating in networks, while the barriers found are addressed.

The challenge remains, therefore, with the barriers found and employees' enthusiasm, to continue pushing the ecosystem concept without disrupting the competencies at which the company has behaved extraordinarily.

## 2.3 Is the culture ready?

This section presents the empirical research conducted to answer the third research question: is the organisational culture ready to adopt a new ecosystem/network mindset? The section provides a description of the organisational culture. Research acknowledges the culture of an organisation has a direct effect on how that organisation innovates and executes its innovation strategy (Tidd & Bessant, 2020). Moreover, introducing useful concepts of organisational culture can help explain past successes and failures of innovation initiatives (Schein, 1988). Given the learning condition of employees shown above after performing the same tasks for a long period of time, describing culture can help to predict how the organisation will feel about a new implementation (Schein, 1988). For these reasons, the learning perspective of culture is used, being Schein and his work the main reference throughout the chapter (1988).

### 2.3.1 Introduction

In this and the following paragraphs I define culture and the methods used by Schein to study it within an organisational context. Culture is defined as “the accumulated learning that a given group has acquired during its history” (Schein, 1988, p. 7). The emphasis is particularly in the learning aspect of how the group changes with time. As the definition shows, the larger the group and the longer its existence, the more the culture is ingrained in the organisation and the harder it is to change it.

Several methods exist to explain organisational culture. Some have widely been studied by organisational psychology researchers. Examples are studies based on surveys handed in to employees, empirical descriptions, or ethnographic research. No method can match the detail of an ethnography or the structure and quantification of surveys. Unfortunately, these are usually time-consuming or not providing accurate answers respectively (Hofstede, 1996). Schein defends the use of a method that is ‘clinical descriptive’, whenever organisational consultants have the chance of studying culture on site. The method relies on the physical active participation of the researcher in the environment where the culture is studied. By inquiring key stakeholders, the framework explained below can provide an overview of the company’s culture (Schein, 1988).

### 2.3.2 Method

Within the first three weeks of the assignment, I take the role of an organisational consultant and use Schein’s framework to describe the culture. The two main methods used for this purpose were interviews and observations. The interviews conducted in the second week of the project have been, indirectly, the source of cultural insights. The questions asked can again be found at Appendix 1. The questions that were particularly relevant to the organisational culture were the ones about barriers and relationships across departments and the nature of business activity of the company.

Observations took place at headquarters, especially at shared rooms (as the canteen and halls) and at the department where the assignment takes place. Conversations with colleagues were an insightful manner of understanding the culture, but no strict rule nor script was followed for that. Consequently, the chapter ends by stating the limitations this brief and applied study may have.

Schein distinguishes between three levels to describe culture (Figure 6). The highest and most superficial level is called *artifacts*. Artifacts are everything we can see and feel from establishing contact with a new group. Everything related to physical actions or tangible objects that have an impact on how we perceive the organisation. Artifacts usually do not have a clear or logical explanation behind unless we ask employees about the underlying *values*, the second level of



Figure 6. The levels of culture.  
Source: Schein, 1988.

culture. Values are beliefs and principles for which the organisation stands for and help align the group towards its organisational goals. When values stay in a group for a long period of time, they tend to be taken for granted and become even harder to decipher. It is here when we see the third level: *assumptions*. Assumptions are behaviours and ideals that can only be discovered by active questioning of an outsider and the effort of motivated insiders that want to decipher why they do the things they do.

After explaining what culture is and how it is measured, I look at how the organisation can be described in each of these levels.

### 2.3.3 Results: artifacts, values and assumptions

**Artifacts.** Since artifacts can be directly perceived, the method used to fill in this element were mainly observations. A first-time visitor would notice at the artifact level a high degree of formality, paired with monumental office architecture and clean furniture organised around private workstations for employees. Once one is involved in day-to-day activities, we can continue to notice a high degree of politeness during group meetings, an emphasis on executing tasks, and a structured implementation of activities, usually supervised by a manager a level above in the hierarchy line.

**Values.** Values were derived by interviews and by consulting corporate documentation, such as the annual report and letters from the president (KLM Royal Dutch Airlines, 2022). There is no proof that the latter represents day-to-day activity, but it is seen as a starting point to understand where the organisation heads. We can understand that an organisation that requires the pace of activity of KLM can only thrive if execution and efficiency are the main values behind employee's mindsets. These values have been stated by employees in the previous section, again cited:

*"The majority of our company, KLM, is focused on execution, not on innovation."*

The focus on productivity and operations has enabled KLM to remain competitive in the extremely demanding airline industry. When the acclaimed researcher Michael Porter developed the framework on the five forces that shape competitive strategy, he gave the example of an airline industry as one substantially affected by rivalry (Porter, 1985). Fortunately, young employees conscious about sustainability and innovation are starting to populate KLM's desks. KLM has formed three new strategic pillars around technology, sustainability, and the customer. The new strategy brings with it a change of values based on innovation and environmentally friendly performance, but these will still take time to be ingrained in the workforce.

**Assumptions.** Assumptions were derived after having informal conversations with stakeholders, finding the implicit assumption and confirming it with the company mentor. The objective was to delve into what the source of values and artifacts is. It is important to state that the goal of phrasing the assumptions is for them to be representative of some of the organisational and cultural issues, but may not be generalisable to the whole of the organisation.

The following paragraphs outline the assumptions. At the company, the focus on execution of tasks can be explained if it is assumed that 1) a person is individually responsible for what she has agreed to do. Job descriptions based on individual goals and performance leave sometimes insufficient room for sharing knowledge with others. Moreover, based on the company's value proposition, it can be assumed that 2) operations are the key activity that provide value to the customer. After listening to interviewees and browsing through organisational charts, it can also be generally stated that 3) truth and wisdom reside a level higher in one's hierarchy position in the organisation. I cite again how cross-silo communication often relies in the hierarchy lines:

*"Most of the requests that come from other departments come from the hierarchical lines, like from my manager."*

The size of the company and the boundaries between departments are also an artifact result of the assumption that 4) additional focus and productivity can be achieved when groups focus on the task they were trained to do, and 5) unsolicited providing of information between departments can hinder the level of productivity a group can achieve. The five assumptions are shown in Figure 7. As stated above, these are not complete in terms of how KLM operates each of its business units, nor even representative of the totality of departments or employees. Nevertheless, they do help in understanding the nature of activity of the industry and common assumptions held by employees.

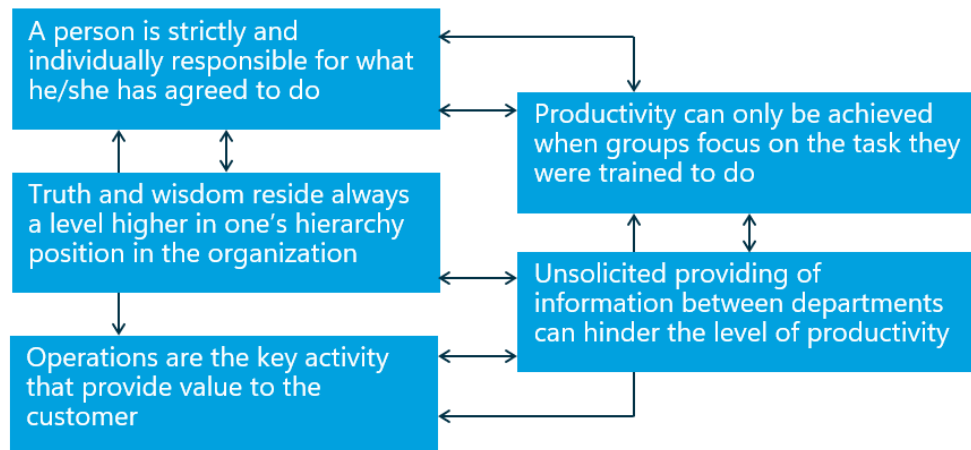


Figure 7. Assumptions related to innovation activities at KLM

### 2.3.4 Discussion

From the elements derived from Schein's framework, there is no doubt that depending on the organisational goal some elements can be a positive enabler. For example, execution, focus and productivity may be phrased as capabilities that have allowed KLM to become the flag carrier of the Netherlands and one of the largest European airlines. An organisation's core capabilities can enable it to achieve its business goals (Prahalad & Hamel, 1990). But core capabilities can also become rigidities (Leonard-Barton, 1995). What was the source of providing value years ago can become an obstacle to delivering a new value proposition or a new process innovation.

The cultural analysis highlights what could be a problem for the company in the future. The future success of the company may depend on its ability to become more effective in innovation, by implementing new technologies or bringing new incremental process innovations as core activities, yet it believes that the source of providing value to the customer comes from focusing on performing the same activities better each time. Increasingly the organisation may find itself in an environment requiring quick endorsement of new ideas yet has systems and procedures that slow the innovation process. To be more innovative it needs to give more room for exploration within the company, yet it undermines lateral communication.

### 2.3.5 Conclusion

The goal of this chapter was to provide a brief introduction to culture at the organisation, with the elements that Schein with his learning approach highlighted. Artifacts, values, and assumptions helped in describing the culture at the company. It is concluded that some of these elements described can become an obstacle to a future innovation or to the implementation of the ecosystem concept. The results outlined a set of assumptions, such as value creation residing in operational activities and productivity in silos. Innovating in networks has advantages, but lateral collaboration can become a challenge with the more operationally driven and hierarchical-mindset

actors within the network. The assumptions can be an asset for the company when running its business. Nevertheless, what is beneficial for operations can be a potential barrier for innovation. The organisation may pay close attention to the culture of the employees involved within a certain ecosystem, as the concept relies in transfer of knowledge and collaboration that may be hindered by the organisational culture.

To finalise, I outline the limitations the research conducted has. The insights were based on interviews and observations carried out during a short period of time and visited limited spaces throughout the company. Some of these insights have required the intuition of the researcher and may be highly subjective. The sample of interviewees and colleagues observed is not representative of the whole organisation, and it remains uncertain whether the set of values and assumptions will be representative of the actors within an ecosystem. Nevertheless, this brief research is helpful to better understand how organisational culture and innovation relate to each other, how likely an ecosystem-related implementation may be received by the organisation, and where the efforts should be directed towards in case the elements described above are identified within an innovation ecosystem. In the next chapter, I take the insights from this and previous chapters to write a problem statement and continue developing interventions that facilitate the implementation of the innovation ecosystem.

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## 3. Problem definition

In this chapter, after researching literature on innovation networks, analysing the interviews, and the organisational culture, the underlying problem is defined that affects innovation practices and the implementation of the innovation ecosystem. In other words, insights from the previous chapters are gathered to define the problem the graduation project will attempt to solve.

The chapter follows a structure that is suitable for the phrasing of business problems, termed as structured problem solving. The approach was chosen for the reason of including a broader spectrum of possible problems (organisational, strategic, cultural, etc) to analyse rather than already design-related issues. The approach was also chosen due to the clear structure it provides for solving organisational problems and the experience management consultants have with such problems. The reference to develop such approach in this chapter is the one presented by Baaij in his *Introduction to Management Consultancy* (2013), but other references exist in the subject. The structure follows three steps:

1. Identify the underlying problem
2. Identify its root causes
3. Select as assumption what the main cause is

Before starting to develop a solution, it is particularly important to understand the assignment and define the underlying problem that the solution will attempt to solve (Baaij, 2013). In some cases, an assignment is started with an action rather than a real and accurately defined problem to solve. There is the risk of providing a solution to an inexistent problem (Baaij, 2013). The chapter therefore aims to take a step back before developing solutions. The chapter ends with a key question and a problem statement which summarises the problem and the actions that will be taken to develop a solution.

### 3.1 Identifying the underlying problem

The insights gathered in previous chapters have shown several issues such as doubling effort, barriers between departments, and silo thinking. All of these rely on communication across barriers. The number of observations seem to point out to inefficiency in terms of collaboration across departments. We have seen that a culture in which an innovation ecosystem is implemented should be one that avoids top-down hierarchical communication but facilitates lateral cooperation (Markman, 2014).

Lawrence and Lorsch's seminal study on organisational integration stated that in dynamic competitive environments, different units across the organisation become increasingly specialised (1967). Each part focuses on its tasks and starts to develop their own beliefs and attitudes that

create sub-cultures within the company. These differences can create conflicts and misunderstandings. The remaining different departments should always be able to understand each other and collaborate for common goals (Lawrence & Lorsch, 1967). Moreover, when it comes to innovation activities, active and creative cooperation is a necessity when innovation needs emerge (Ettlie, 1992).

The conclusion from these disturbing events and theory is that there is a shortage of lateral communication between departments at the organisation. Lateral communication and cross-divisional collaboration are still inefficient or even non-existent. If we are to implement an innovation ecosystem, or even work on any small intervention that has a similar direction, the inefficiency has to be addressed. Otherwise we risk that these interventions will not succeed due to the fact that employees do not have the mindset or behaviour needed for such interventions. The risk is wasting time in development effort when what should be addressed is the culture and the behaviour of the workforce.

Once that the problem is defined, I explain what the root causes of the problem are. I turn back into the research conducted to categorise the different causes behind the issue. In principle, it is assumed that tackling one or several of these causes would help in fostering cross-divisional cooperation and facilitating the implementation of the innovation ecosystem and any related intervention.

### 3.2 Identifying its root causes

The research conducted can be categorised into three interdependent causes that are behind the problem of cross-divisional collaboration. Since the problem at hand was pinpointed by employees, each cause is accompanied by a quote that represents where it was derived from. Employees showed a lack of interest, awareness and impossibility to connect cross-divisionally:

#### 1. Employees do not want.

The first cause shows a lack of interest from employees in collaborating with external departments. It relates to how the organisation operates and how it has been built since its foundation. Operational efficiency is a core competency of KLM that has allowed it to remain competitive. The head of strategy of a certain division at KLM said:

*"The big activity of KLM is passenger traffic. The core of our activity remains passenger business. [...] The majority of our company, KLM, is focused on execution, not on innovation."*

Focus on short-term execution of tasks can hinder innovation of activities that investigate projects in future horizons (Tidd & Bessant, 2020).

#### 2. Employees do not know they can.

Secondly, employees sometimes do not know they can. These short-term tasks have been performed by the same individuals over a long period of time, with the learning conditioning consequences that these bring. A change manager pointed out:

*"There's a lot of people that have been working here for the past 30 or 40 years and done their job the same way for the past 30 or 40 years."*

These results in that sometimes employees are not aware of what others are doing, and therefore the possibilities for inter-departmental collaboration evaporate.



### 3. Employees directly cannot connect and collaborate with peers from other departments.

Thirdly, employees sometimes cannot find the time or means to collaborate. A sustainability program manager pointed out:

*"Because right now we do it a bit more informal. So (for example) there's someone responsible for SAF (Sustainable Aviation Fuel) within the sustainability office, and often people just call her and ask: we need someone who's working on SAF in Cargo, who do I call?"*

The lack of an available means and urgency to discover other parts of the organisation results in employees dialling to find someone who can help or asking the closest manager. This results in sometimes frustration for the employee that is disturbed and the limitations of the manager's network respectively.

#### The causes are independent but complementary

These are three different independent causes that can exist at the same time as an employee's concerns. For example, employees that cannot establish a connection may have not even inquired if they can as they may not want or know. The diagram below shows some of the reasons why the three causes may occur.

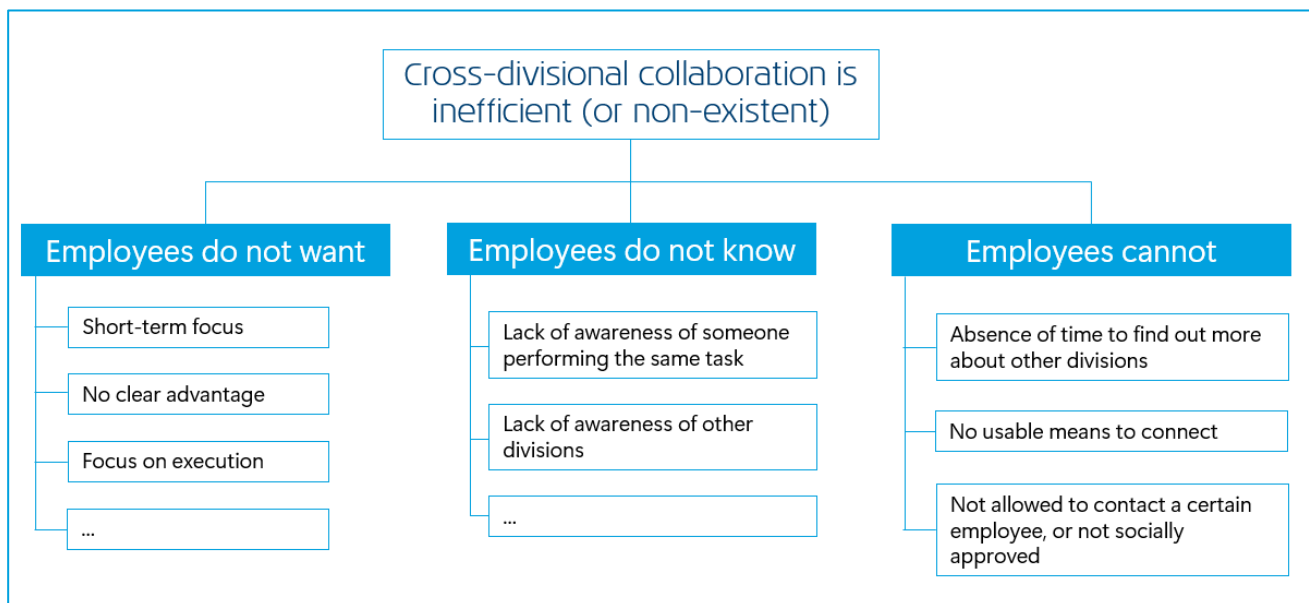


Figure 8. Three different root causes to the problem

### 3.3 Selecting as assumption what the main cause is

This subsection has the goal of identifying the causes that have a biggest impact on the problem. Is the problem mainly about awareness? Interest? Or about enabling connections? All affect and have to be addressed. Nevertheless given the timeframe of the project it is not possible to accomplish all. There is a trade-off between completeness and impact, and choices have to be made.

In this sense, we have to acknowledge the method that employees now use for cross-divisional connections, and the need some have highlighted about creating 'something on how to find people'. The initial assignment can help in this direction tackling one of the causes. A product that visualises and gives information on the actors involved in a certain innovation topic can help in making employees more open-minded about network models of innovation. In these models, collaboration is key, and employees will be able to find in the product peers to connect and be aware of what they are doing.

Therefore, given past unsuccessful efforts and the acknowledged potential in creating a usable means the initial assignment is seen as an opportunity to address one of the causes of the underlying problem. The cause is highlighted in Figure 9. At the same time, complementary interventions are needed to see an effective implementation of the innovation ecosystem.

A holistic resolution of the problem is needed. The inefficiency of cross-divisional and cross-departmental collaboration needs of solutions that address each of the causes derived above. If there is no advantage felt by employees to collaborate across units it will affect the creation of awareness to start the collaboration process. At the same time, if the connection is not facilitated, employees may not want to continue with the process. Holistic yet focused interventions are needed. As Volkoff and colleagues put, an organisation is responsible for developing the mechanisms that allow the effective integration of its business units (2005).

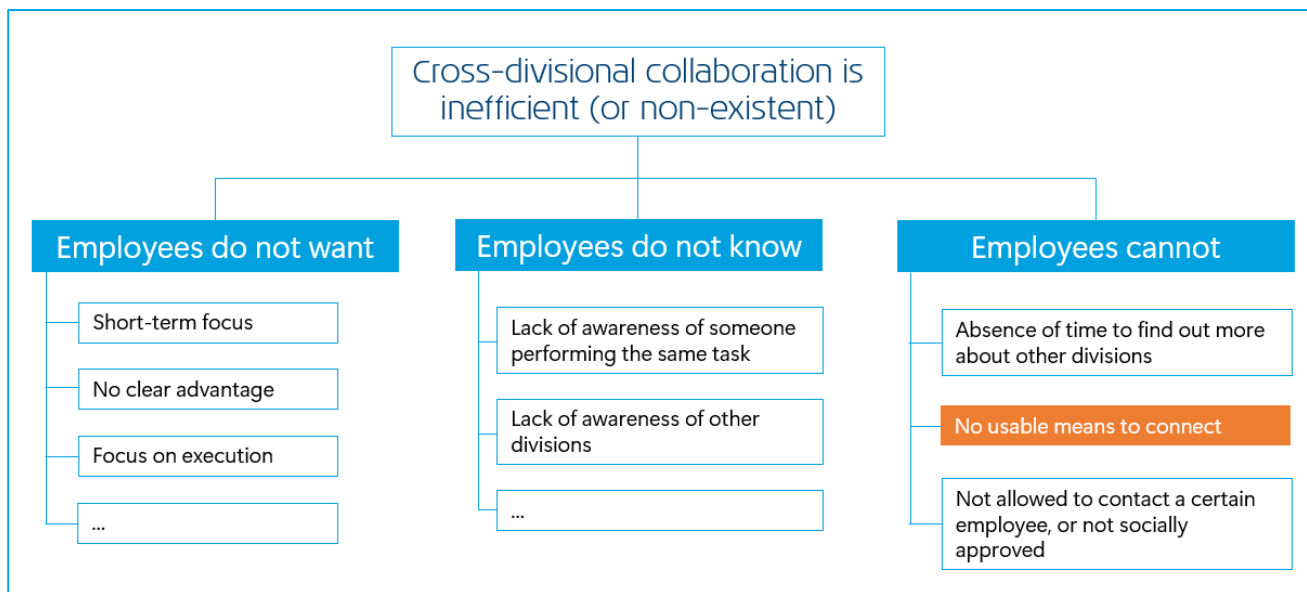


Figure 9. Cause addressed by the product

The next chapter presents a description of the context of the project. After that, I will elaborate on the next steps to develop interventions that help in implementing the innovation ecosystem while addressing the collaboration issue.

### 3.4 Key question

*How should KLM develop interventions to implement the innovation ecosystem while facilitating cross-divisional collaboration?*

An alternative form could be:

*How should KLM intervene to innovate in networks while changing behaviour towards a more innovative culture?*

### 3.5 Summary

Interviews with stakeholders and research on innovation management and organisational integration noted the inefficiency of cross-divisional collaboration at KLM. To see the innovation ecosystem concept thrive at KLM, interventions are needed that tackle the underlying problem and its causes holistically. Nevertheless, the initial assignment can help with one of the causes. There is a need for a means for employees to connect across divisions with innovation purposes.

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## 4. Context analysis

As a problem is always surrounded by its context, this chapter includes a description of the stakeholders, constraints and criteria that surround the project. This chapter differs from the context explained in the beginning of the report in that it presents content that needed from the research phase to be stated. This includes describing the stakeholders involved, constraints that limit the solution space, and criteria that allow to differentiate between possible solutions.

### 4.1 Stakeholder analysis

The stakeholder analysis identifies the main groups of actors that can affect the development of the project, along with their concerns and goals. According to Freeman (1984) answering the following three questions can provide a holistic yet valuable analysis to be aware of the actors and their intentions. These questions are:

- Who are they?
- What do they want?
- How will they try to get it?

After identifying the stakeholders an answer to these questions is given. The stakeholders are, based on the description, plotted in a stakeholder matrix that locates them in terms of interest and impact they can have in the project (Figure 10). Interest measures how engaged a certain person or group can be, how they will ask for results or support the initiative because they share a common interest. On the other hand, impact measures the power each stakeholder has, and how that power could either benefit or diminish the result of the project. The stakeholders and their impact and interest are:

**Knowledge institutes.** Representing organisations such as TU Delft or the University of Amsterdam. KLM has established partnerships with these organisations for research purposes. A good example is the graduation thesis of which this project is about. From a personal perspective, the interest for a well-functioning end result is high, as it would make TU Delft more valuable as stakeholder. The project tries to increase their impact, so that more of these projects can take place when the result proves valuable.

**Microsoft.** Microsoft is the main software provider of KLM. Although it is not certain whether the result will be digital, it is important to define the partnership between Microsoft and KLM that could provide support if it is required. Microsoft could have high interest in the success of a use-case, as it would help them with promotion and validation of their services. It is important to limit this, as conflicts of interest can affect the development of a feasible and viable solution in the long term.

**Innovation team.** The innovation team has the responsibility of orchestrating innovation among the different units. It has the biggest interest in having a well-functioning, known, and cohesive organisation. As the team is the main orchestrator, it has also the highest impact in deciding the outcome by continuing or not with implementation.

**Senior management.** While not directly involved, senior management is also interested in seeing a more innovative KLM. Due to the fact it is not part of their daily agenda, interest and impact are less than the main orchestrator. The project aims to increase their interest when seeing what is possible when facilitating an ecosystem mindset.

**Employees.** This group represents a variety of employees across the different business units at KLM. As a whole, the employees are the protagonists of the project: they hold a high impact on the outcome. At the same time they are reluctant. Often busy, the project aims to increase their interest so that KLM can become more innovative with their cross-functional collaboration.

**Customers.** Customers are here not only passengers, but also clients from other business units at KLM. Improving the customer experience is one of the goals of many innovation projects. If there is proof that a better management of innovation can be reached by developing a means for cross-divisional collaboration, customers will feel the benefit. Customers would increase their standards towards airlines and KLM would be better positioned. The impact can grow throughout the project.

**Government.** Finally, the government has also a stake in the project. Not only new policies are being developed on encouraging airlines to become more sustainable but also restrictions on carbon emissions affect KLM's operations. Increasing government's interest in the research of innovation ecosystems would facilitate that projects are funded with subsidies in the future.

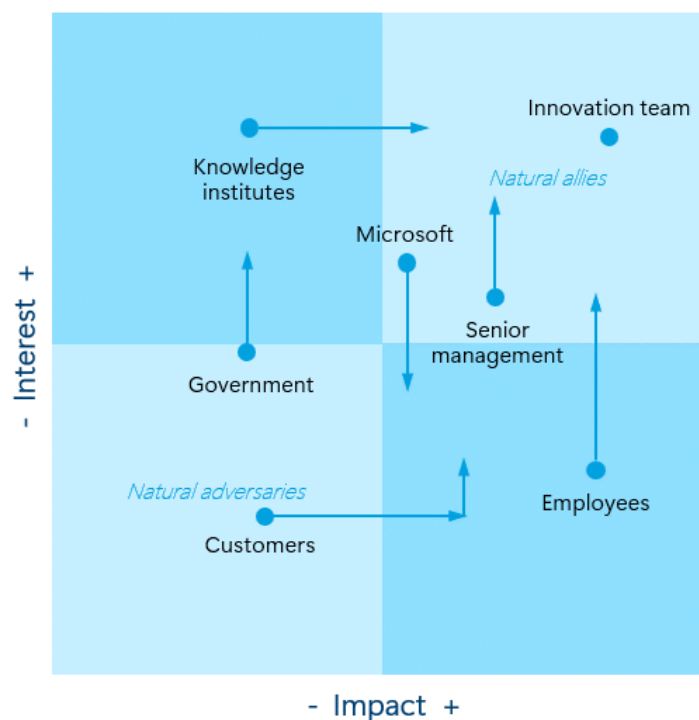


Figure 10. Stakeholder matrix

## 4.2 Constraints

Not every result of this project will be feasible or acceptable for the client and the stakeholders. Constraints describe the boundaries that limit the solution space. Any possible intervention that lies outside these boundaries will not be considered (Baaij, 2013). Limitations consider privacy and security constraints, time taken for implementation, and room for new investments. These three constraints were phrased after a meeting with the Radical Innovation team (Arlette vd. Veer, personal communication, February 15, 2022).

### **The result of the project must remain confidential and private within KLM.**

As an example of a very large organisation, KLM owns intellectual property that is important for its business activity. Each bit of information that forms part of the interventions must be secure and private for the stakeholders. The result must remain private within KLM.

### **The result of the project must be operative in a period of 20 weeks.**

The project must show results in terms of value by the end of its period. That means that the project result must be able to perform the functions needed in 20 weeks. The project has to take it into consideration and prioritise the showcase of value added within this period.

### **Limited investment possibilities in assets, licenses, or new software agreements.**

Due to the covid pandemic, the financial health of the company has not recovered its pre-pandemic levels. Investments have been cut down and adding new capabilities is not an initial option for the company. Therefore, the design must initially consider the existing resources that are available nowadays.

## 4.3 Criteria

After reducing the solution space with constraints a set of criteria guide the solution development process. The criteria establish distinctions between possible interventions according to KLM's concerns and desired benefits. Criteria help to rank each of the interventions within the solution space and were phrased after an agreement with the Radical Innovation team at the Transformation Office (Arlette vd. Veer, personal communication, February 15, 2022). The criteria were modified after the midterm meeting in consultation with the supervisory team. The main three updated criteria are:

**Ability to facilitate cross-divisional connections.** The possible interventions will be ranked according to how they can facilitate connections across divisions. Since the end goal is fostering cooperation, each solution will vary in how it plans to materialise the connection among employees.

**Ease of implementation.** The interventions that are proposed will have to deal with the pace of activity at KLM. It is important therefore to find interventions that can easily be integrated within KLM's operating procedures. How easily these interventions are integrated directly links to the next piece of criteria: the risk of destroying previous efforts.

**Risk of destroying previous efforts.** KLM is the oldest airline in the world and flag carrier of the Netherlands. Their operations-based nature of activity and culture are valuable elements that are essential to how KLM runs its business. New efforts to help KLM become more innovative must acknowledge this without destroying its operational excellence.

Other important additional criteria are:

**Ability to retrieve information.** Cross-divisional collaboration starts with awareness. To reach that awareness information is needed. This information can contain, for example, the contact details of a key person to gather tacit knowledge or explanations about innovation topics and other forms of explicit knowledge.

**Ability to identify cross-divisional topics.** Additionally, facilitating cross-divisional collaboration must help find synergies across business units and departments. When the explored topic is common between two or more divisions, the means should be able to showcase this as an opportunity for collaboration or sharing of knowledge.

## 4.4 Problem statement

The following problem statement compiles every element discussed above in an organised table format (Table 5).

Table 5. Problem statement

Problem statement	
Current state	KLM is a large organisation, focused on execution of tasks and with barriers to innovation activities
Disturbing events	Innovation projects carried out double and in silos, collaboration barriers between departments
Desired result	Cross-divisional awareness and collaboration, shared use of technologies, shared procurement and contact with suppliers
Key question	How should KLM implement the innovation ecosystem while facilitating cross-divisional collaboration?
Stakeholders	Innovation team, senior management, knowledge institutes, employees, Microsoft, customers, government
Constraints	<ul style="list-style-type: none"><li>- Confidentiality, privacy</li><li>- Time implementation</li><li>- Use of existing capabilities and resources</li></ul>
Criteria	<ul style="list-style-type: none"><li>- Ability to facilitate cross-divisional connections.</li><li>- Ease of implementation.</li><li>- Risk of destroying previous efforts.</li><li>- Ability to retrieve information</li><li>- Ability to identify cross-divisional topics</li></ul>

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## 5. Solution Development

The goal of this chapter is to present the solution development process that helps in continuing with the implementation of the innovation ecosystem at KLM while addressing the cross-departmental collaboration issue pinpointed in Chapter 3. From Chapter 2, we know about the necessity of innovating in networks in the present business environment. We also know about the culture at KLM, its heritage and nature of activity that results in operational excellence that can potentially hinder innovation practices.

To continue implementing the innovation ecosystem concept in the organisation, the innovation team asked for the development of a (digital) product that visualises the actors involved in a certain innovation topic. The research in this thesis showed an underlying cross-departmental collaboration issue that has to be addressed. Chapter 3 showed the causes that are behind the lack of collaboration. Fortunately, from the previous chapter we know the development of this product can help addressing one of the causes: the product can provide a means to facilitate relationships and create new connections and awareness. Nevertheless, for the product to reach its full potential it must be used, and the rest of the causes continue to be addressed.

In the remaining sections of this chapter I explain the interventions that the project developed. The interventions listen to the needs of the users, the orchestrating and managing need of the innovation team and the organisation, and the cooperation barriers between departments. The goal is to develop interventions that fit the timeframe of the project, as well as recommend what should be considered in the future if the innovation ecosystem concept is to remain alive in the organisation. The chapter follows again Baaij's structured solution development process (2013). First, I will revise the initial assignment.



## 5.1 Redefining the initial assignment

All the interventions part of the solution development process that will be proposed need to be judged according to criteria and constraints of the project (Baaij, 2013). In this section, the initial assignment is converted into two clear interventions that will be judged accordingly.

The development of the previously defined product is one of the interventions, but for the product to be used it must be found. The innovation team uses an intranet for communication and knowledge management purposes in which ideally the product could be integrated. This would ease the communication efforts of innovation within the company, having all the elements within one site. The problem is the current intranet is in a very rudimentary and chaotic state (Arlette vd. Veer, personal communication, February 15). For both knowledge and product to be easily found, another intervention needs to be pursued. The two interventions are therefore:

**1. Design a tool that represents the actors involved by innovation topics.** The tool can directly address one of the causes of the underlying problem exposed in Chapter 3. By representing the actors involved in the ecosystems, the tool can help in creating new connections and relationships. The tool facilitates collaboration and acts as a means. Additionally, research in Chapter 2 has shown the advantage information and communication technologies can have in the sharing of knowledge across an organisation (Pasiante & Andriani, 2000; Dattée et al., 2018; Gawer et al., 2014; Tidd & Bessant, 2010) and the necessity for avoiding the hierarchical structure for cooperation in innovation (Markman, 2014).

**2. Organise the knowledge required for innovation activities at the organisation.** Organising the knowledge required for innovation purposes in the intranet with a clear information architecture is needed for both knowledge and product to be easily utilised. The intranet requires the design of a new layout and content structure. The goals are that information is more easily retrieved and that the new architecture can support the growth of content in the future. The visual appeal of the site will also be considered to create a more inspirational site that can increase the interest and expertise of the visitors.

After phrasing two interventions born from the initial assignment, I search for a set of complementary interventions that can achieve the goal of the project and address the rest of the causes.

## 5.2 Method for finding interventions

The objective of the method is to find new approaches that can continue developing the innovation ecosystem at the organisation, aside from the interventions presented above. To find such approaches given the timeframe of the project a brief knowledge search is conducted. The sources mainly include articles from Harvard Business Review, MIT Sloan Management Review, and McKinsey Quarterly. These were assumed to provide best-practice examples and practical insights, as such sources publish a set of best-practices that have been previously tried by large organisations. The magazines were scanned with five themes in mind: collaboration, innovation, strategy, networks, and organisation. Each of these themes dive into the examples by other corporations into how they have approached a situation within the theme. After reading the abstract and having the goal of developing the innovation ecosystem the article was gathered if relevant or otherwise had to be discarded.

It is important to note that the set of best-practices or interventions gathered have been successfully implemented by other organisations at the time of the paper, but are not meant to be applicable nor recommended to KLM in this project. Table 6 shows every source that has had an input on the interventions.

Table 6. Categorized literature sources.

Theme	Source	Title	Authors (Year)
Collaboration	Harvard Business Review	Cross-silo leadership	Edmonson, A.C., Jang, S. & Casciaro, T. (2019)
Collaboration	MIT Sloan Management Review	Knowledge Diffusion through “Strategic Communities”	Storck, J. (2000)
Collaboration	MIT Sloan Management Review	Why Your Company Needs More Collaboration	Kiron, D. (2017)
Collaboration	Harvard Business Review	Develop Your Company’s Cross-Functional Capabilities	Leinwand, P., Mainardi, C., & Kleiner, A. (2016)
Collaboration	Harvard Business Review	Cracking the Code of Sustained Collaboration	Gino, F. (2019)
Innovation	OUP Oxford	Nurturing Innovation Hot Spots	Gratton, L. (Ed.). (2008)
Innovation	Harvard Business Review	How to Create an Innovation Ecosystem	Markman, A. (2014)
Strategy	Harvard Business Review	Strategy That Works: How Winning Companies Close the Strategy-to-Execution Gap	Leinwand, P., & Mainardi, C. R. (2016)
Networks	Harvard University Press	Structural Holes: The Social Structure of Competition	Burt, R. S., (1995)
Networks	McKinsey Quarterly	The role of networks in organizational change	Cross, R.L., Parise, S., & Weiss, L.M (2007)
Organisation	Harvard Business Review	Matrix management: not a structure, a frame of mind	Barlett, C. & Ghoshal, S. (1990)
Organisation	MIT Sloan Management Review	Matrix Organization Designs: How to combine functional and project forms	Galbraith, J.R. (1971)

Note: only new sources that were not cited in previous chapters are cited in this table

The next section presents the interventions. The table has shown the set of sources used to discover best-practices. Eventually, in the interventions a source from the previous research phase is cited if the contribution made is similar to the sources presented above and can help give more context to the intervention.

## 5.3 Interventions

This section presents the possible interventions to consider. The objective is to present the idea, hypothetical impact, and tackled cause of each intervention. Afterwards it is judged whether or not

it can be developed during the project according to criteria and constraints. The interventions that are selected will be elaborated on in the next chapters. The first two interventions have already been numbered; the possible interventions therefore start from number three:

**3. Identify the cultural brokers that can connect groups of employees with an innovation purpose.**

In organisations certain individuals excel at interface collaboration between different groups (Markman, 2014). These individuals are called brokers. Brokers act as a bridge, connecting groups and other individuals across functions and geographies with a common purpose (Burt, 1995). By identifying who the brokers are and nurturing them, companies can increase collaboration across units (Edmondson et al., 2019; Cross et al., 2007).

**4. Define hiring and onboarding skills that allow for future collaboration among groups.**

Collaboration is central to how companies create value and establish a competitive advantage. Companies should look for future hires who have the skillset to work cross-functionally across the organisation (Kiron, 2017). When it comes to hiring, companies need to look for characteristics such as empathy, curiosity and adaptability that allow the culture to support collaboration (Gino, 2019; Edmondson et al., 2019).

**5. Foster strategic alignment of innovation activities.** Since organisations have a limited ability of exploration to innovate, the allocation of resources should be focused on a portfolio of projects that is aligned with the strategy of the company (Tidd & Bessant, 2010). At the same time, companies need of cross-functional capabilities to implement their strategy (Leinwand & Mainardi, 2016). Bringing alignment and understanding of the direction can help in increasing collaboration and create the necessary cross-functional capabilities among units (Leinwand et al., 2016).

**6. Implement a matrix organisational structure.** KLM is a function-based organisation. A matrix organisation is one in which members in cross-functional teams report to managers from different functions (Galbraith, 1971; Bartlett & Ghoshal, 1990). An example is a team with an engineering task in which a marketing expert is contributing, while reporting to both engineering and marketing managers. Matrix organisations can help in collaboration when team members can communicate with and find answers to questions from several disciplines (Cross et al., 2007).

**7. Organise cross-divisional dialogues to encourage face-to-face interactions.**

Cross-divisional dialogues help in bringing employees from different units together for a period of time. The preferred format for these dialogues depends on the situation and context. Nevertheless, research has acknowledged the advantages of face-to-face interactions when it comes to the sharing of ideas and knowledge across functions (Gratton, 2008; Edmondson et al., 2019; Storck, 2000). Face-to-face interactions facilitate reaching the deeper knowledge and mutual trust that are needed for an effective group work in the future (Storck, 2000).

The researched sources were combined into five interventions that have been successfully tried before by other organisations. In the next sections the interventions are categorised into the areas of the organisation that are addressed, and judged according to constraints and criteria to select the ones that have the most potential or would be feasible to be accepted by KLM and developed during the project.

## 5.3 Categorisation: McKinsey 7S Model

With this section the aim is to categorise the interventions by the area of the organisation they address. It is assumed that implementing the innovation ecosystem concept will require changes and effort in several areas, given the scope of ecosystems at the organisation and the collaboration required among business units.

The McKinsey 7S model is a framework that contains seven interdependent elements that influence the organisation's ability to change (Peters & Waterman, 1982; McKinsey & Company, 2018). Despite being old, the model has been successfully used by leading consultancies and businesses with a similar goal: categorising the areas of the organisation to intervene, or that are affected by a certain intervention. With this reason the model is assumed to fit the purpose and is used in this section of the thesis. The elements of the framework are:

Table 7. McKinsey 7S Model

McKinsey 7S Model	
Strategy	Set of choices and trade-offs to achieve a competitive advantage.
Structure	Organisational hierarchy and coordination.
Systems	Processes and procedures to run the organisation.
Shared Values	Firm's beliefs that characterise its behaviour.
Skills	The organization's workforce skills and capabilities.
Staff	The organization's human resources.
Style	Behavioural patterns of key groups such as managers.

Source: Peters & Waterman, 1982

Table 8 shows the interventions presented above, together with the tackled cause of the underlying problem and the elements from the 7S framework. The element chosen is the main one that is addressed by the intervention, although some interventions address several elements. The element was chosen after understanding what the intervention required and selecting the one that is substantially affected by the intervention. This overview shows the variety of elements that are addressed with the new set of interventions. As mentioned above, meaningful changes come from interventions that address the totality (or several) elements in the organisational context (Peters & Waterman, 1982).

Table 8. Categorised interventions by cause and factor

7S element	Root cause	Intervention
System	Employees cannot	1. Design a tool that represents the actors involved by innovation topics.
System	Employees do not know	2. Organise the knowledge required for innovation activities at the organisation.
Staff	Employees do not know	3. Identify the cultural brokers that can connect groups of employees with an innovation purpose.
Skills	Employees do not want	4. Define hiring and onboarding skills that allow for future collaboration among groups.

Strategy	Employees do not know	5. Foster strategic alignment of innovation activities.
Structure	Employees cannot	6. Implement a matrix organisational structure.
System	Employees do not want	7. Organise cross-divisional dialogues to encourage face-to-face interactions.

## 5.4 Evaluation of interventions

The interventions were judged according to the criteria in a five-point scale (Figure 11). These criteria are the previously defined ability to foster cross-divisional connections, ease of implementation and risk of destroying previous efforts in the organisation. The method used to fill in the criteria of each intervention is by individual reflection. After understanding and agreeing on the criteria with the company mentor, scores were assigned to each of the interventions in the three criterion. An explanation of this reflection is given in the following paragraphs. The goal is to provide further elaboration on why a certain intervention has been chosen.

**Ability to foster cross-divisional connections.** It is useful to be aware of how each of these interventions facilitate the implementation of the ecosystem by triggering connections, as the objective is to have a loosely coupled structure that does not depend in the hierarchical means every time there needs to be sharing of knowledge (Markman, 2014).

Designing a tool (1), if effectively implemented, can be a purposeful means to be available at any time without disturbing others' performance. It can help convert the tacit knowledge in employees that have a complete overview of the organisation (usually managers with a great deal of experience) into explicit knowledge available for the most recently onboarded colleague. The tool receives a medium score because it needs to be used to enable the connection. Complementary actions (not only the creation) are needed for the tool to become more effective in this first criterion.

Organising information (2) can be helpful if the structure facilitates the gathering of knowledge and awareness of what the organisation is doing. The organisation can help find the means and be more effective in its use, but it is not *per se* creating the connection.

Cultural brokers (3) are key for the organisation to excel at interface collaboration. If these members are identified, consultations can be targeted at them, and the organisation would be more aware of what these employees can provide.

Hiring and onboarding skills (4) are important, but not necessarily directly facilitate the connections. The same goes for the strategic alignment (5).

On the other hand, implementing a matrix structure (6) in which employees have to report cross-divisionally is directly facilitating the objective. It does not receive the maximum score due to the fact that only employees that report to managers have that connection, leaving large teams or blue-collar groups unattended.

Finally, organising cross-divisional dialogues (7), if the social skills of the employees are effective, it can directly facilitate new relationship forming.

**Ease of implementation.** The easiness with which the intervention is implemented is an important criterion for two reasons. First, simple and fast interventions can gain acceptance from senior management faster. Second, less time and effort are required to see the results.

Designing a tool (1) depends on the availability and built-in functions of the software, as well as acceptance within the organisation. Still, there are prototyping methods that can simulate complex software functions, and acceptance can be gained by limiting the resources used while starting a pilot. Organising a knowledge-management system (2) follows a similar reasoning depending on skills, required actions, and future acceptance.

Identifying the cultural brokers (3) can become more difficult depending on the tacit knowledge that employees already have. Given the company's heritage and divisionalised form, it is assumed that a large amount of knowledge lies within employees' minds without being converted into explicit knowledge to be shared. Additionally, novel analysis methods such as the network representative method can ease the burden traditional social network analysis methods require (Celik, 2018). The potential is therefore there.

Hiring and onboarding skills can be harder (4), since it is an ongoing process with additional and important skills to look for into the employee's background and experience.

Strategic alignment (5) can and must be implemented. Unfortunately, it is direct responsibility of another department in the organisation and can interfere with their ongoing tasks. This diminishes the score in ease of implementation for the graduation project.

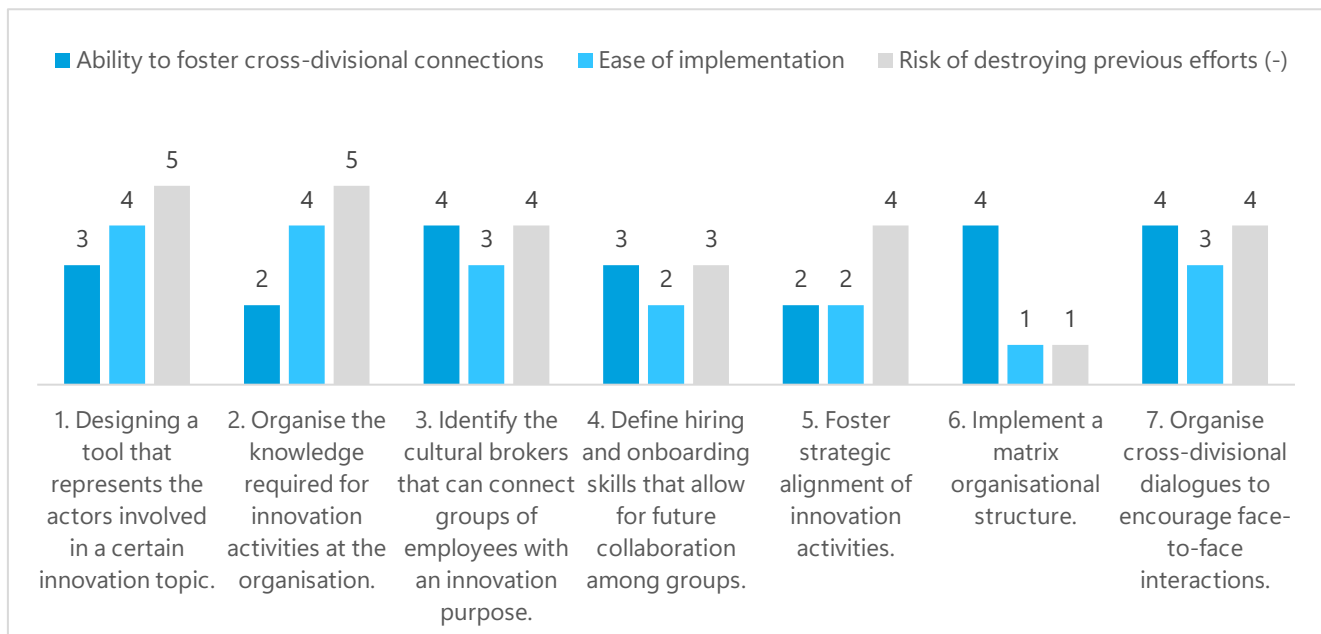


Figure 11. Interventions evaluated by criteria

Implementing a matrix structure (6) is assumed to be hard to implement due to the new reporting procedures across divisions that would be needed.

Finally, organising dialogues (7) is achievable but, fortunately or unfortunately, after diving into what has been done in this respect, several cross-divisional dialogues have been identified. It is a helpful intervention according to employees' opinion and to the references found.



**Risk of destroying previous efforts.** Given the history and nature of activity of KLM, its operational excellence is a competency that must have taken management effort in the past. This criterion attempts to judge the interventions according to how they benefit, complement, or disrupt what the organisation is already competent at.

Designing a new tool (1) and planning a pilot would limit the risk that the potential implementation can have, since the stakeholders and resources involved would be limited. The score is therefore high (risk is low).

Similarly, organising the knowledge-management platform (2) has a similar risk, since an unorganised version of the platform is already operative.

Identifying the brokers (3) adds a small amount of risk, since new conversations and connections may arise which could potentially go against the company's operations. To bear in mind, but the risk continues to be low.

Hiring employees with new skills (4) can help for collaboration, but it is uncertain whether these new skills help during operations. A thorough analysis of each job vacancy and required skills would have to be conducted and reassessed with the new skills. The risks are therefore higher.

Fostering strategic alignment (5) is assumed to have less risk, since it is assumed to be a must-have intervention. It is such a must-have that, again fortunately or unfortunately, it is direct responsibility of another department.

The matrix structure (6) is assumed to have the highest risk given the disruptive changes it could bring to the organisational structure.

Finally, organising the dialogues (7) has low risk, since it is a complementary form of meeting that does not interfere with the tasks and procedures from operating activities.

### 5.4.3 Reflection

After evaluating each of the interventions according to the criteria, a selection is made of the ones that will be elaborated on during the project. Unfortunately, after diving into some of the interventions and what has been previously done at KLM in the subject, I discovered that some were already responsibility of a parallel department or were since long time ago carried out. Examples of these are the strategic alignment and cross-divisional dialogues.

Novelty of each intervention as a criterion was therefore implicitly added. Novelty helps to judge and discover the experience the company already has in such intervention. The conclusion is therefore that there are a number of best-practices researched by leading management and business journals in the topics of innovation and collaboration, some of which are already being carried out by KLM. It is positive news, but the project will focus on what has not been done before.



## 5.5 Selection of interventions

The method used to choose the interventions to be developed was to revise the scores of the interventions in each criteria with the provided explanations. The interventions chosen are the ones with the highest score, after eliminating the ones that have already been carried out at the company. Defining onboarding skills (4), fostering strategic alignment (5), implementing a matrix structure (6) and organising dialogues (7) were discarded due to the reasons given above. The three final interventions are:

- 1. Design a tool that represents the actors involved by innovation topics.**
- 2. Organise the knowledge required for innovation activities at the organisation.**
- 3. Identify the cultural brokers that can connect groups of employees with an innovation purpose.**

### *Feedback from supervisors*

After consultation with the company and academic mentors the scope of the project was agreed. The purpose of this communication effort was to bring alignment between the supervisors and argue in favour of the actions I would carry out with the project. This set of three is in line with the motivation and necessities of the innovation team and KLM, interest and skills of mine, advice and feedback received from the academic supervisory team, and constraints such as the duration of the project.

### **Summary**

This chapter researched a set of best-practices that have been identified to be helpful when implementing an innovation ecosystem and addressing the lack of cross-divisional collaboration at organisations. In order to have a holistic overview of where the project is intervening in the organisation, the interventions were categorised with a framework to know the areas of the company that are being addressed, as well as evaluated with previously defined criteria. The interventions developed in the next section will be the design of a tool, the organisation of innovation-related knowledge, and the identification of cultural brokers.

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## 6. Design a tool

In this chapter I present the development process of the tool that represents the network of actors involved in innovation topics. The design of the tool is one of the three interventions that will be carried out within the project. The tool was chosen due to its ability to facilitate connections and awareness between stakeholders, as well as for its relative ease of implementation and risk of destroying previous management efforts.

The process of development takes place as a set of iterations between different phases from ideation to implementation. The phases are ideation, prototyping, software selection, testing, and implementation. For clarity and structure of the report these are presented with the given order. Nevertheless, the iterative nature of the design process meant that new ideas emerged during testing phases, and prototyping would not have been possible without selecting a certain software to test. Therefore, this chapter shows a set of milestones and choices made categorised but without chronological order. The process started stating a design goal.

### Design goal

The tool has the ambition of facilitating connections within the company around a certain innovation that is being developed:

**“Design a digital tool that helps employees to connect across divisions on a certain innovation topic”**

### 6.1 Ideation

The ideation phase includes the creation of new ideas up to the building of the first low-fidelity prototypes. Key to the ideation phase was getting immersed in the context of the company. From understanding the new corporate strategy to visiting the hangars where aircraft is repaired, such activities helped in getting immersed in the context in which the design will take place. This visits contributed with insights to the design and purpose of the tool. For example, once a few groups of employees were found at the hangars using drones for visual inspection of the airplanes. If drones were to find another cross-divisional use case, having a representation of the actors that have previously used drones would be helpful in lowering the barriers, and avoiding that new suppliers are contacted, or new teams built for carrying out a similar task.

Conversations with key stakeholders, brainstorming and feedback from testing sessions were all sources of new ideas. One insight came from a user that highlighted the need of him finding a quick and relevant contact if he was to start a new innovation project. The tool must then facilitate that users can choose from an array of topics and see who can do what and is willing to.

Another important event to highlight in this phase was the co-creation session held with the company mentor. The session had the purpose of empowering final users of the tool to design alongside (IDEO, 2015, p.109). Following the IDEO *Field Guide to Human-Centered Design* (2015), the session followed a number of steps:

**1. Identify whom to invite.** Criteria for the selection of a relevant participant were the involvement in innovation activities, future use of the tool, and availability. The company mentor's experience in the company, both at managerial and innovation roles, the need for a well-functioning tool, and availability, positioned her as the best candidate to participate in such a session in the early phases of the project.

**2. Organise the space.** A room with digital capabilities was booked for the session to take place (Figure 13). Other brainstorming materials were gathered, such as post-its and markers. The use of the Microsoft Surface Hub was seen as an advantage especially to facilitate the digital sharing of the results of the session.

**3. Engage in design activities.** Brainstorming and sketching were the main activities of the session. A set of sketches that materialised ideas and continuous feedback between the participants helped make the session interactive and fruitful. One of the best ideas that surged from the meeting were the ability of the tool to allow switching between representing the totality of the organisation and the subset engaged in innovation, and to smoothly transition between the states.

**4. Capture the outcome.** The outcome was captured as several digital sketches and future ideas for prototyping. Figure 12 shows part of the whiteboard that was saved to use for later inspiration.





Figure 13. Participants and space during the session.

Participants used the Microsoft Surface Hub to sketch together during the session. The device helped in later retrieving the results.

Other ideation activities have been the use of sketching as a means for materialising ideas on paper, representing either the layout or interactive snapshots of the tool. Figure 14 shows examples of how these were drawn and stored for later reflection.

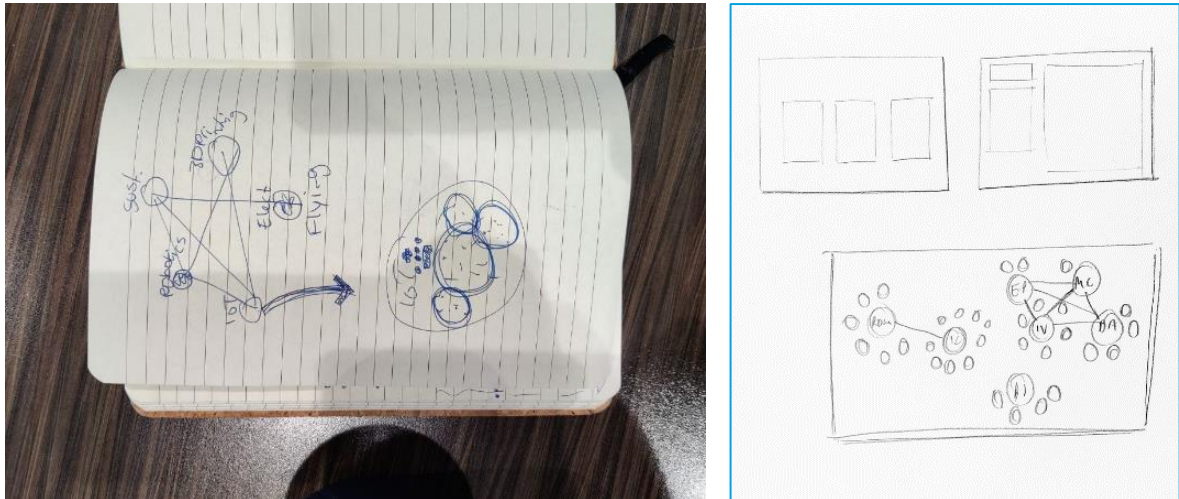


Figure 14. Sketching notebook.

## 6.2 Prototyping

A list of functional requirements was drafted before starting with the first prototypes of the tool. The list shows a set of functions the user needs to be able to perform. The interviews and conversations with users were the source of the user needs. The requirements are shown in Table 9.

Table 9. List of functional requirements.

List of functional requirements	
A	Users must be able to select a number of innovation topics
B	The selection must show the stakeholders involved per unit
C	The tool must show a zoomed-out overview of the units
D	Users must be able to see key information from stakeholders
E	The tool has to be easily updated
F	The tool must identify cross-divisional innovation topics
G	The tool must facilitate cross-divisional communication

After phrasing the set of requirements, the ideas gathered from sketching and co-creation activities were included in the creation of a demo version of the tool. Building a demo required less effort than building a functional prototype at the stage of the project. Moreover, the software to use had not been decided upon. Creating a video demo therefore had more creative freedom. The result was used to trigger discussions with software and IT specialists on what would be the ideal software to support the functions shown.

After the first ideas and sketches were drafted, the development process required to make these ideas functional and interactive. Making the ideas functional meant that users could start interacting with the tool. A number of low-fidelity prototypes were built with Figma. Figma was chosen due to the facts that it is free and prototypes can be easily shared online. The prototypes were shared with a sample of the potential users of the tool. As an example, the prototype shown in Figure 16 allowed the user to click on a number of solid squares and visualise, from a group of names, a subset of the group that is linked to the clicked square.

Ideas about having a modular tool in which cards of content or filters are added was born when thinking about how to add new information and what will be added in the future. Ideally, the tool would allow to filter the information by topics or business units; and show a set of cards or space that informs the user about the stakeholder, their involvement, and areas of expertise.





Figure 16. Prototype with Figma

As mentioned above, the series of low-fidelity prototypes helped in triggering the discussion with external parties for the selection of a software that can enable the performing the functional requirements. The next section elaborates on the meetings and iterations had to select an available software.

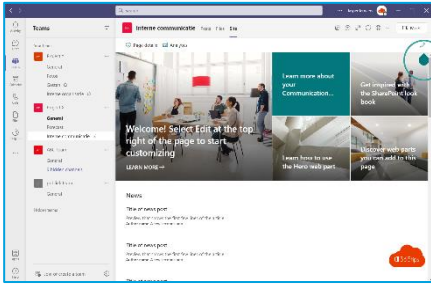
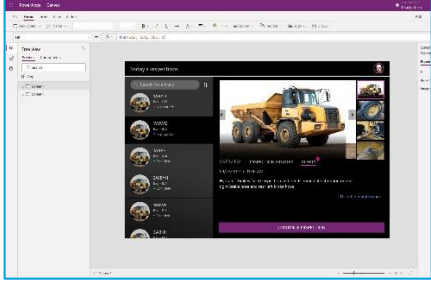
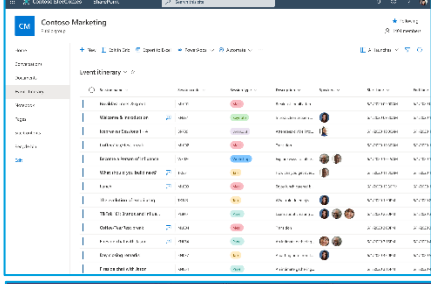
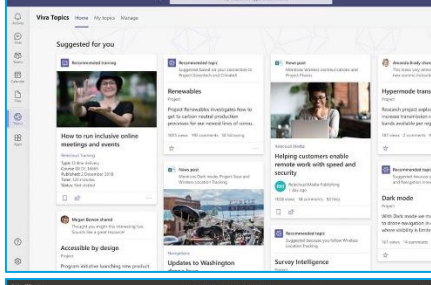
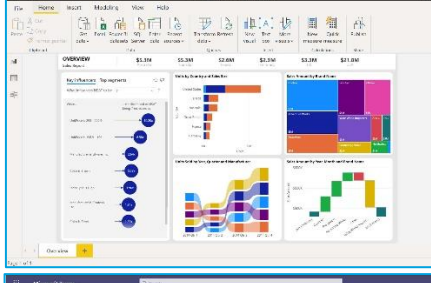
## 6.3 Software selection

Conversations were held with both internal IT specialists from the company and external software developers and account managers from Microsoft Netherlands to advise on the selection of a suitable software to perform the requirements. Their knowledge of previous development experience for internal systems and the current capabilities of the Office Suite 365 respectively ensured the value of the meetings for the progress of the project. In the meetings, I introduced the insights from users gathered, with a prototype or demo to showcase and trigger the discussion. Advice and recommendations received from them helped in narrowing the search for the tool to become feasible.

A number of options were considered. Table 10 summarises the advantages and disadvantages of each software option. For SharePoint, PowerApps, SharePoint Lists, and Power BI the internal team showcased what had previously been done within the organisation. Each of these options were brainstormed during meetings. Although what was done previously with each software did not show the full potential of the software, it helped in getting more familiar with the functions the software enables. For Viva Topics, since it has recently been launched, a “pitch” presentation was held with Microsoft Netherlands in which they explained the intricacies of the new software.



Table 10. Software options

Software	Snapshot	Description	(Dis)advantages
SharePoint		<i>SharePoint is a content management collaborative platform that allows users to configure and share their own websites and documents</i>	<ul style="list-style-type: none"> <li>+ Available and understandable</li> <li>+ Fastest to develop</li> <li>- Missing interactive design capabilities</li> <li>- Manual building of each representation</li> </ul>
PowerApps		<i>PowerApps is a development platform for web and mobile apps.</i>	<ul style="list-style-type: none"> <li>- Limited interactive design capabilities</li> <li>+ Available and understandable</li> <li>+ Integration with SharePoint</li> <li>- Automated building of representations</li> </ul>
SharePoint Lists		<i>A SharePoint List is a functionality that allows users to build lists and visualise them within SharePoint</i>	<ul style="list-style-type: none"> <li>- Limited visualisation possibilities (only list-type)</li> <li>+ Available</li> <li>- Limited retrieval and showcase of data</li> </ul>
Viva Topics		<i>Viva Topics is a knowledge management system that uses AI to search and identify relevant topics from and for the organisation</i>	<ul style="list-style-type: none"> <li>+ Automated discovery of cross-divisional topics</li> <li>- Visualisation capabilities are still limited</li> <li>- New unavailable product for the rest of the organisation</li> </ul>
Power BI		<i>Power BI is an interactive data visualization software product developed by Microsoft with primary focus on business intelligence.</i>	<ul style="list-style-type: none"> <li>+ Excellent capabilities to handle and retrieve data</li> <li>+ Great visualisation possibilities</li> <li>- Used within certain teams but unavailable for the rest of the organisation</li> </ul>
Yammer		<i>Yammer is an enterprise social networking service used for private communication within organizations.</i>	<ul style="list-style-type: none"> <li>+ Excellent possibilities for sharing within a social network</li> <li>- Building a representation of a network is not possible</li> </ul>

After judging and testing the different options, a final meeting was held with Microsoft Netherlands to ensure the capabilities of each of the options were understood. The general agreement of the meeting was the use of Power BI as the future software behind the interactive tool. The reasons behind the selection were:

- ✓ Power BI's capabilities to handle and easily retrieve data from different sources
- ✓ Power BI's visualisation possibilities via add-ons from external parties

Although Power BI as a software was known and utilised in several departments of the organisation, it was not available for the totality of it. Several meetings were held to study the possibility of acquiring new licenses. Further elaboration in this matter is provided in the implementation section.

## 6.4 Testing

Ideas and prototypes were tested throughout the project. After the design of new features, feedback was solicited to potential users and iterated afterwards. Users were always asked to provide negative feedback, since the majority tended to be overly positive about interacting with a digital tool. A wide cross-section of users was asked to try the different configurations and versions of the tool, from low to high digital literacy, and from wide and narrow experience in both innovation and operations.

The majority of the sessions were informal, in which users contributed with ideas and these were quickly implemented and tested out again. Nevertheless, several formal testing sessions were held when the prototype reached higher definition of details. The next sections outline the method and results these more formal sessions followed.

### 6.4.1 Method

Five participants were invited to individual feedback sessions in which their input was gathered to improve the tool. The sample group included employees from the corporate office and the operational units (Table 11). The sample group is nevertheless limited in terms of age of the participants asked, being the oldest 35 years old and the youngest 26. This responds to availability reasons at the moment of conducting the tests. Participants were selected on the base of their availability and informed about the purpose of the meeting and their role in the development process.

Table 11. Participants for formal testing sessions

Role	Area	Digital Literacy
Intern	Corporate	Low
Consultant	Corporate	High
Team Lead	Operations	Medium
Manager	Corporate	Medium
Consultant	IT Services	High

The place proposed to hold such sessions was decided by the participant for availability reasons. During the session, the procedure followed three steps. Photographs of the sessions are presented in Figure 17 and Figure 18

**1. Describing a scenario.** First, users were explained the background of the project, thanked for their participation and were told to provide both positive and negative feedback. Afterwards, users were given a scenario in which to interact with the tool. Users were told to imagine to be during their working day and need to contact someone to learn about a new technology or topic. The topic varied and matched the employee's current job role.

**2. Letting the user try.** Users were presented with a laptop, mouse, and digital tool available and open in one tab of the browser. Users had to navigate the list of topics, select the one that was interesting for their task and find the employees that can potentially be helpful in getting more acquainted with a topic. A big screen represented real-time what the user was doing for the researcher to be able to see.

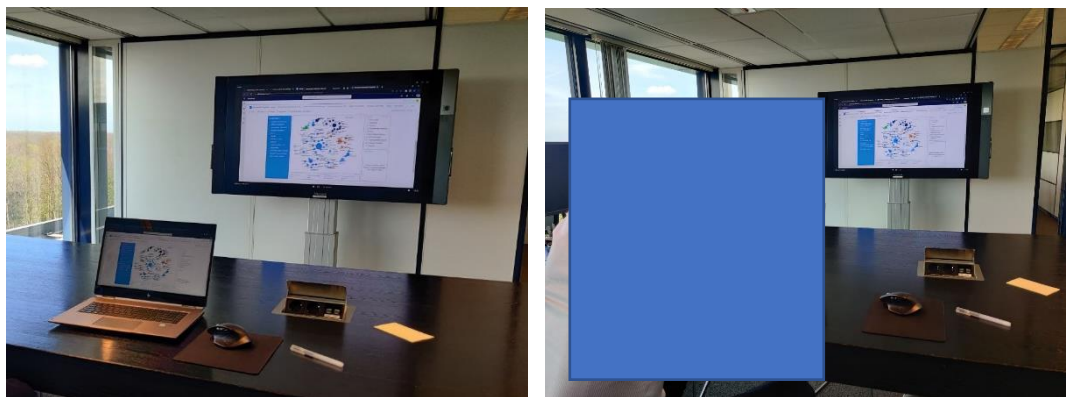


Figure 17. User testing prototype

**3. Gathering the feedback.** The formal sessions were recorded, after asking for permission, to later review the key feedback points and synthesise them. A set of key improvement points were gathered in order to continue developing and improving the tool.

#### 6.4.2 Results and discussion

This section presents the findings gathered from the testing sessions. Users appreciated and struggled with a variety of characteristics of the tool. In terms of saturation of results, the fifth participant did not add any new result with the feedback. The results are therefore considered saturated bearing in mind the limitations of the research described below. The most important feedback points that were synthesised were:

- ✓ Layout, organisation, and modularity
- ✓ Dynamism and interactivity of the animations
- ✓ Overall style matching the KLM brand
- ✗ Usability problems when clicking and going back to the overview
- ✗ Categorisation of topics and ecosystems
- ✗ Readability of parts of the text
- ✗ Lack of data and information on the topics and people

Users shared a common appreciation to the overall style of the tool. Layout and other graphic design aspects were compliments gathered from the totality of the participants.



Figure 18. Participant during a formal session

The participant was given a scenario on which to interact with the tool. Afterwards, feedback was given on the features the participant liked or disliked.

On the other hand, some of the users struggled when clicking one of the actors in the tool to gather further information about them. A small glitch exists with Power BI and the add-on that is used to build the visualisation. When users select one of the actors and try to select another one, eventually the tool freezes on the information shown for the previous actor. It is easily solvable, since by double clicking on another actor the tool shows again the correct information. Nevertheless, users required assistance in this respect.

Another issue pointed out is the categorisation of some of the topics chosen for the tool. Several innovation topics exist, some of which are project-related while others technology-related. Users found confusing having only one list in which the topics are presented. Another iteration was needed to solve this.

At the same time, testing the tool became a way in which to update and align with different employees of the ambitions of the innovation team with the digital tool. Employees became aware of the wide pool of employees that are engaged in a certain innovation topic. The test brought awareness and alignment with the tasks of other departments that benefit from such vision and overview.

Finally, for some actors it is a challenge to find relevant information to show within the tool. At the moment, the tool shows the name, job role, department and division within the organisation. The ambition was to show a short description of what each actor is doing and how they can contribute to the ecosystem. Such gathering of information will require decision-making on the governance that is expected within the actors of each ecosystem. The governance was left out of the scope of the project and is left for the final recommendations, where advice will be given on how to define it.

### 6.4.3 Conclusion

The goal of the formal round of tests was to gather from a comparable perspective how participants performed to a same scenario and similar setup to the presented tool. There is compliance on the aesthetic quality the tool has reached with the first informal iterations. Additionally, some categorisation and small usability issues need to be solved or explained for the users to experience the tool with full potential.

Two important limitations of the sessions conducted are the variety of participants and the place in which the tests were conducted. For the former, due to reasons of availability, a small sample of participants were selected, the majority from the corporate office, although a special effort was put to include stakeholders from operational units. It is expected that the majority of users of the tool will be for a managerial purpose. Nevertheless, it was since the beginning the ambition to include a wider user base that could use the outcome of the tool to improve the innovativeness of their unit and their understanding and commitment of actors within a certain ecosystem.

The tests were conducted in different environments. Flexibility in where the tests were conducted was a requirement if the tests were to take place. Although participants had the same setup, certain contextual conditions could have altered the results of the test and make participants less comfortable or alter their opinions of the tool due to previous experiences in the place.

In sum, the testing sessions brought substantial learning outcomes that were used to improve the design of the tool. After improving the points addressed in the previous sections, the tool reached the state explained in the next page.

## 6.5 Final result

This section explains the final design of the tool. A manual of the tool is included that contains in-depth explanations of the aspects covered in this section. The manual can be found in Appendix 3.

The design of the tool can be divided in two parts: input and output. Since the tool is able to automatically build representations out of data an input section is added where the intricacies of data retrieval are explained. Later, the tool showcases an overview of the actors involved in a certain innovation, providing information about their role and division, as well as a short description of their involvement in the innovation. All these form part of the output of the tool.

### 6.5.1 Input

The selected software Power BI is able to build automatic representations out of data. In the tool, a spreadsheet is used as a data source. The tool therefore retrieves information from the spreadsheet and builds the representations each time there is a modification of the spreadsheet. In order to identify the stakeholders around a certain innovation, four elements are needed: name, job position, department, division, and ecosystem. Table 12 shows a simplified example of how the spreadsheet is designed:

Table 12. Example input spreadsheet

Name	Role	Department	Division	Ecosystem
John Doe	Manager	Marketing	XYZ	Sustainability

With these five columns the software is able to cluster the actors that are within a certain ecosystem. After clustering in the ecosystem, the software at the same time clusters within divisions and departments. The output is a visualisation of every actor that forms part of the ecosystem, categorised by division and department.

### 6.5.2 Output

Power BI visualises data in dashboards. Every element that allows for interaction within the tool is visible in the dashboard. Power BI allows for choosing a variety of filters and charts that visualise the data stored in the input file. The design of the tool relies therefore in the adequate selection of elements to add to the dashboard that allow the user to perform the functional requirements. The elements chosen for the final designed dashboard are divided in three sections within the dashboard and are visible in Figure 19 and Figure 20.

**Left and selection of filters.** Three filters are needed to categorise all the information. The first filter shows the different types of ecosystems within the company. Ecosystems can refer to the inter-organisational network of innovation, temporary project-based ecosystems, or topic-based such as certain technologies. The second and third filter allow the user to choose from an array of ecosystems and divisions. The filters take the colours from the company's brand manual and UX design guide. The first step is highlighted in orange, as it is the most vivid colour and where users should start.

**Centre and visualisation of actors.** The central part of the dashboard shows the visualisation of the group of actors involved. The representation of actors shows the department and the division to which they belong. Since the division is the biggest element, for clarity it is represented bigger. Power BI allows to choose a certain size and colour per element listed in the input spreadsheet. By choosing sizes and colours that match each division or department and adding the data to the input table shown in Table 12, the visualisation is automatically created by the software. Such automatization was an

important requirement to ease the task of the innovation team when communicating the overview of stakeholders involved in the innovation.

**Right and information about the actors.** Finally, the right panels inform the user about the role of the actor selected and space is left for a description of their involvement. Another colour from the organisations' brand manual was chosen for the contact panel.

This division of sections from left to right allows the user to focus on the different functions: selecting, viewing, and retrieving. Every selection takes place at the left panel, every visual at the centre, and every piece of information at the right side. The idea of organising the dashboard in three parts was an insight from a user testing session in the latest stage of development.

Colours allow the user to differentiate between panels, respecting the company's visual identity. Power BI allows to automatically build the representations and show the overview of actors involved, categorised by business area to which they belong.

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### 1. Type

- ☐ Internal
- ☐ Project
- ☒ Topic

### 2. Ecosystem

- ☐ Additive Manufacturing
- ☐ Artificial Intelligence
- ☐ Autonomous Operations
- ☐ Big Data & Analytics
- ☐ Drones
- ☐ Internet of Things
- ☐ Robotics
- ☐ Social innovation / HR

### 3. Division

- ☐ Cargo
- ☐ Corporate
- ☐ Customer Experience
- ☐ E&M
- ☐ Flight OPS
- ☐ Ground Services
- ☐ Inflight Services



### Contact

Bart van Lidth de Jeude  
Sustainability Manager  
Sustainability Office  
Corporate

### Description

(Blank)

 Royal Dutch Airlines

Figure 19. Tool snapshot of an example topic.

### 1. Type

- ☒ Internal

### 2. Ecosystem

- ☐ Innovation

### 3. Division

- ☐ Corporate



### Contact

Gerrie Brand  
Press Officer Innovation  
Communication  
Corporate

### Description

Short description about the stakeholder's background, motivation and areas of expertise

 Royal Dutch Airlines

Figure 20. Tool snapshot of the internal ecosystem.



## 7. Organise the knowledge

In this chapter the second intervention is presented: organise the knowledge required for innovation activities at the organisation. The intervention requires the design of a new information architecture and website layout for the company's intranet that visitors use to get informed about innovation activities. The software used for this purpose is SharePoint, due to its internal communication capabilities and the company's partnership with Microsoft. The chapter follows a similar structure than the design of the tool. Two new first steps are added: design of the information architecture and benchmarking of similar designs of competitors. The rest of the steps follow the previous chapter: ideation, prototyping, testing, and implementation.

### 7.1 Information architecture

The information architecture sets the structure that the new SharePoint platform will hold. An effectively designed IA allows to differentiate between levels of content (Adobe, 2021b). The IA organises the information that users want to retrieve in an easier format for them to find the content they are looking for (Adobe, 2021a). The first step was to retrieve all the content to be organised with a content audit.

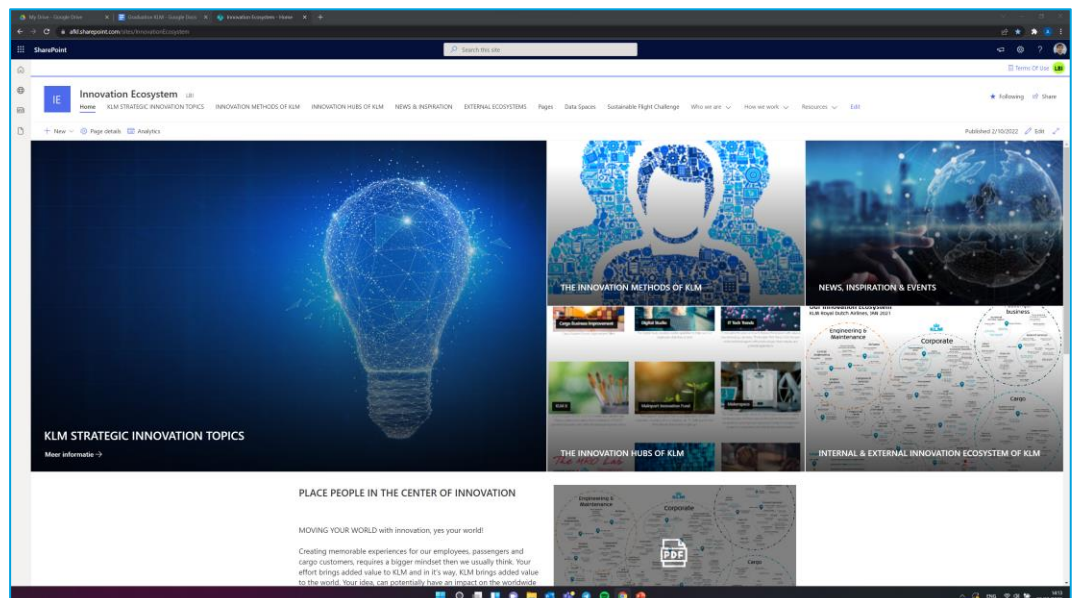


Figure 21. Existing SharePoint before modifications

#### 7.1.1 Content audit

A content audit was conducted to retrieve all the information to be organised. The audit compiled all the URLs accessible from the homepage in an excel file (Figure 22). From the audit, seven pages were defined to have a higher level of importance. This were revised with the innovation team that

is in charge creating the content (Arlette vd. Veer, personal communication, February 22). The seven elements are:

**Strategic innovation topics.** Includes an explanation of the topics in the innovation strategy.

**Masterclass.** Includes a one-hour lecture on the innovation ecosystem.

**Innovation methods.** Includes short tutorials about the available innovation methods.

**Innovation hubs.** Includes fifteen innovation hubs within the company.

**External.** Includes a list of external partnerships.

**Internal.** Includes an overview of the key stakeholders involved in innovation activities.

**News.** Includes a miscellaneous collection of news and inspiration for innovation.

The content audit shows all the content that the old SharePoint included. The content audit stopped at the third level, with a total of 41 sites, as the responsibility of controlling the sites below the third hierarchy level remains in the department or unit that created the site, and not in the central innovation team. In this respect, the audit is also valuable to limit the scope of this intervention.

Site ID	Hierarchy	Page Title	URL	Action	Description	Page Views	Average Time
1	1	Innovation Ecosystem	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem">https://klm.sharepoint.com/sites/innovation/Ecosystem</a>		Homepage		
2	2	Strategic Innovation Topics	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/Strategic%20Topics">https://klm.sharepoint.com/sites/innovation/Ecosystem/Strategic%20Topics</a>				
3	2	Innovation Methods	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/Innovation%20Methods">https://klm.sharepoint.com/sites/innovation/Ecosystem/Innovation%20Methods</a>				
4	2	Innovation Hubs	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/Innovation%20Hubs">https://klm.sharepoint.com/sites/innovation/Ecosystem/Innovation%20Hubs</a>				
5	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
6	2	Internal	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/Internal">https://klm.sharepoint.com/sites/innovation/Ecosystem/Internal</a>				
7	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
8	2	News, Inspiration & events	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/News%20Inspiration%20Events">https://klm.sharepoint.com/sites/innovation/Ecosystem/News%20Inspiration%20Events</a>				
9	2	News	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/News">https://klm.sharepoint.com/sites/innovation/Ecosystem/News</a>				
10	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
11	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
12	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
13	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
14	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
15	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
16	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
17	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
18	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
19	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
20	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
21	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
22	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
23	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
24	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
25	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				
26	2	External	<a href="https://klm.sharepoint.com/sites/innovation/Ecosystem/External">https://klm.sharepoint.com/sites/innovation/Ecosystem/External</a>				

Figure 22. Content audit in Excel

The content audit included links that are out of date. These include sites that need an update due to new projects carried out, a new corporate strategy, or new people or partnerships with the company, among others.

The new IA prioritises the need for finding relevant content, people, and methods to innovate. Based on the interviews conducted at the beginning of the project, employees at KLM showed the need of knowing who is involved in a particular innovation topic. Conversations with the innovation team also made clear the need to show the methods that are available for employees when starting a new project. These insights result in having to prioritise innovation topics, people involved, and methods to be used. A scheme of the architecture following these insights is shown in Figure 23.

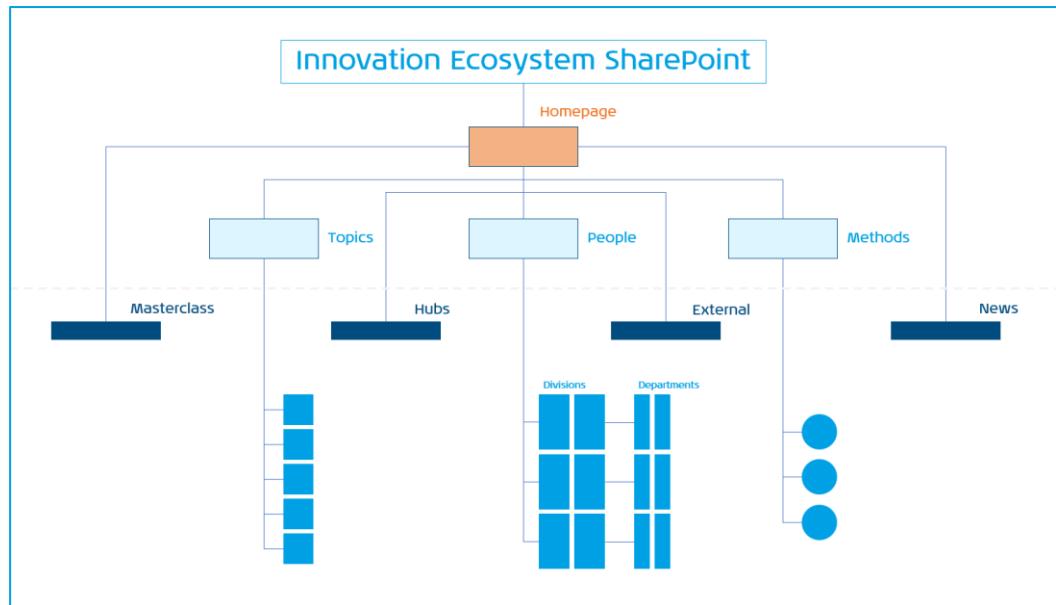


Figure 23. New information architecture

These three elements are prioritised in the position of the visual layout of the new site. The rest of the sites that the content audit identified remain with a lower visual hierarchy. This allows to prioritise the main functions that users want to do when visiting the platform. If in the future new content needs to be added, such as a new method or a new innovation topic, the architecture allows for the content to organically grow. The birth of new content can be included in the new IA and do not affect the structure of the sites. The architecture was designed to have content that is mutually exclusive and collectively exhaustive.

## 7.2 Benchmarking

After having the content organised and before starting with the design process, a brief benchmarking of similar sites in other organisations was conducted. The organisations chosen for this benchmarking were Airbus and BMW. Both companies are involved in open innovation and have communication sites that inform external stakeholders of their progress and knowledge. Revising the content and layout of these sites was used as inspiration for the upcoming ideation.

### Airbus Innovation Ecosystem layout and design

The highlighted aspects from Airbus' layout are the unity of the site making use of the visual identity and the centre-aligned introduction texts that introduce topics to the visitor.

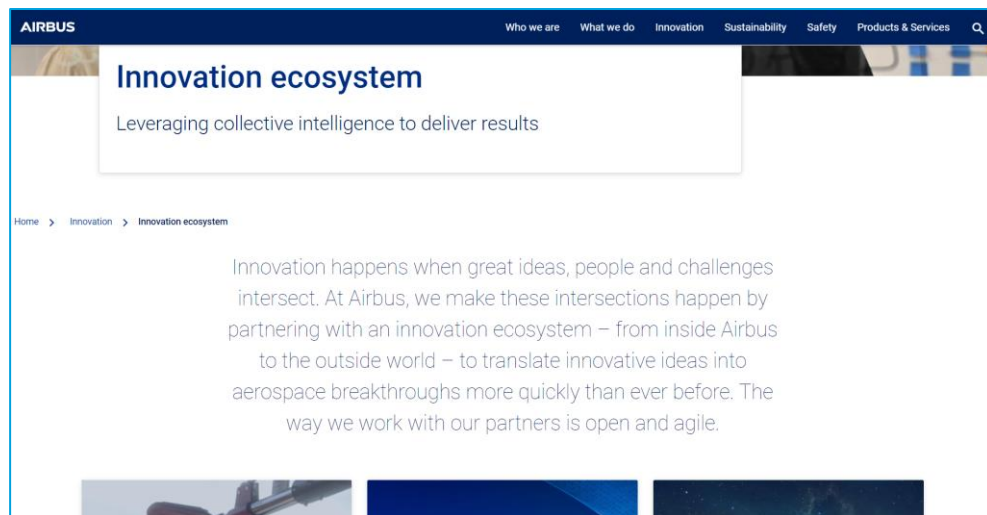


Figure 24. Airbus website design. From "Airbus Innovation Ecosystem" by Airbus, 2022 (<https://www.airbus.com/en/innovation/innovation-ecosystem>).

### BMW Start-up Garage layout and design

BMW on the other hand, makes further use of images, both full-screen and in smaller sizes to redirect the visitor to other parts of the site. The images are of high quality and help convey the entrepreneurship atmosphere.

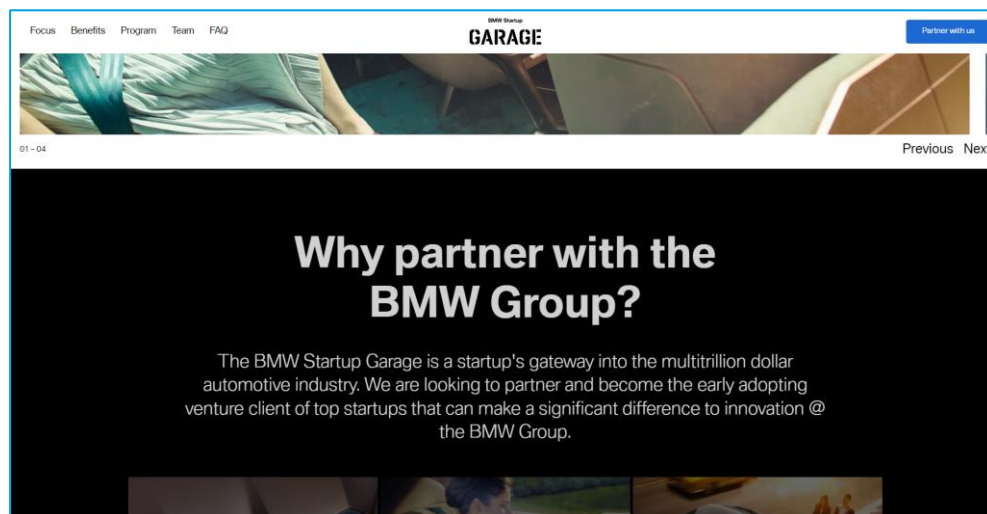


Figure 25. BMW website design. From "BMW Start-up Garage" by BMW, 2022 (<https://www.bmwstartupgarage.com/>).

## 7.3 Ideation, prototyping and testing

After defining the IA and benchmarking, the ideation process began. PowerPoint was chosen to create a first sketch of how the new site could look like (Figure 26). The next section dives into the methods used during the process.

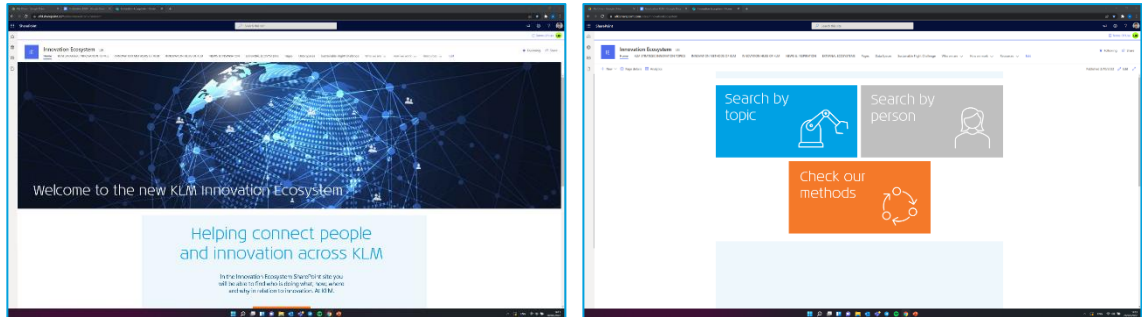


Figure 26. PowerPoint sketch that shows the new hierarchy

### Methods: PowerPoint, sketching and digital scribbling

PowerPoint allows to create precise configurations of elements in the layout without having the final software. Moreover, PowerPoint allows to share the concepts as presentations with other stakeholders on a regular basis. Other methods used in ideation were the use of paper drawings and scribbling over old sites with a red digital marker (Figure 27). The digital marker allowed to highlight the content that can be moved to other parts of the site. Paper drawings are as well useful for materialising new ideas.

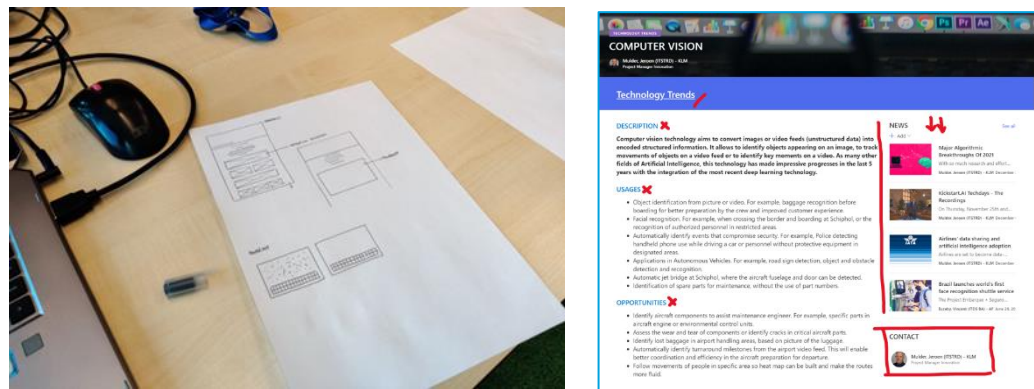


Figure 27. Sketches and red scribbling

When designing an interactive product, the importance lies in the transitions and dynamics and not in the states (Buxton, 2007). To prototype the dynamism of the site PowerPoint was the chosen due to its animation capabilities. Several slides were arranged in which users could see how the interaction would be in the real site. Low-fidelity prototypes in black and white were used for this, as the focus lied on the interactivity rather than in the aesthetics. Figure 28 shows an example of one of these prototypes. The first feedback received from trying the prototype shown in Figure 28 is the overwhelming number of elements. Although the topics and stakeholders as the IA defined were highlighted, the lower-level content had to receive an iteration to respect user preferences.

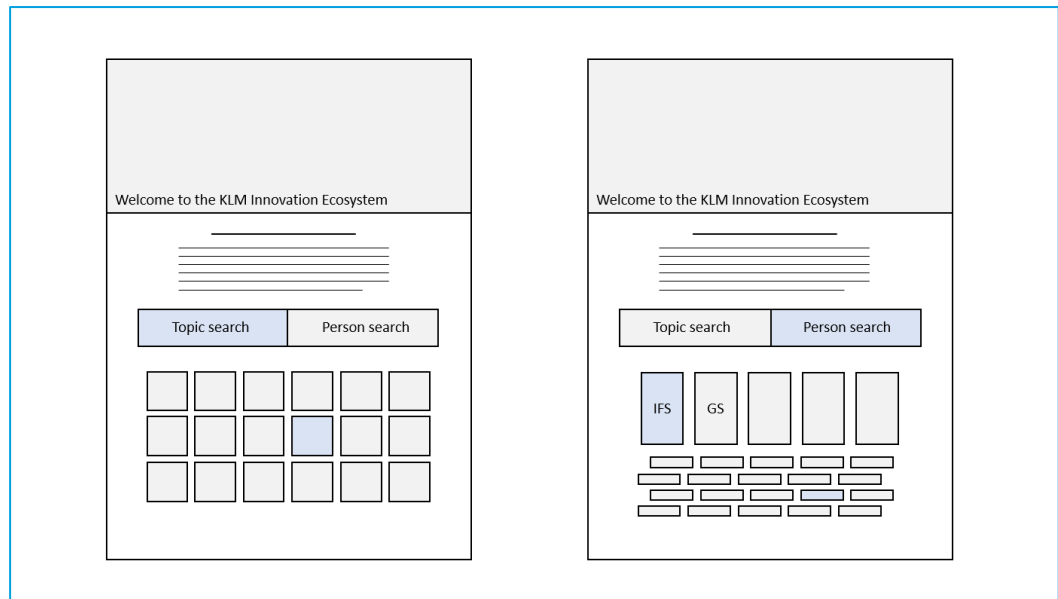


Figure 28. Interactive prototype arranged in PowerPoint



Figure 29. Feedback gathered from Customer Experience team

The methods explained above supported the design process. Each small feature added was, similarly to the chapter before, brought in for discussion and iteration. After the first iterations, the visual identity of the organisation was integrated. The main colours, fonts and style were studied in the UX Design and Brand Identity manuals to include in the new SharePoint layout. Once the latest prototype both behaved and looked similarly to the end version, a feedback session was organised with the Customer Experience design team from the organisation. Several positive and negative aspects of the site were discussed, and feedback gathered from the session (Figure 29).

- ✓ Overall look and feel of the website
- ✓ Use of high-quality images and colours
- ✗ Strengthen stating the purpose of the site
- ✗ Improve the use of blank spaces

## 7.4 Final result and implementation

The next steps included improving the latest prototype according to the feedback received and integration in SharePoint. This version available in SharePoint was used as a means for live prototyping. Live prototyping allows to receive feedback by leaving the prototype available for everyone throughout a period of time (IDEO, 2015). The purpose was gathering feedback from a wider range of users on how organised the new site was and how it allowed visitors to retrieve content more easily. Figure 30 and Figure 31 show a set of screenshots from the latest version. The website is only available for internal use within the company at the moment.



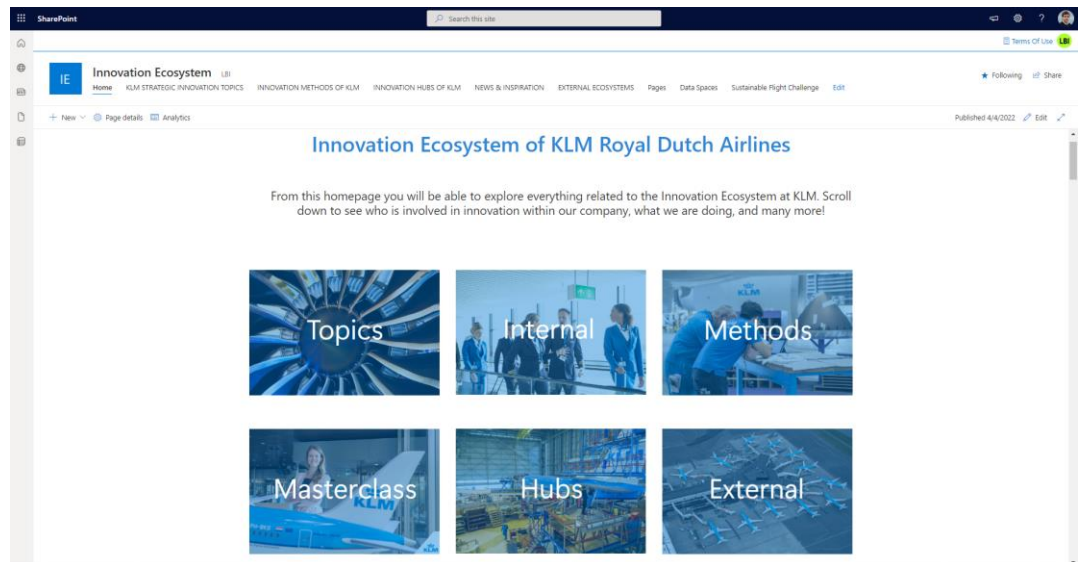


Figure 30. Screenshot of the new layout menu

A tone of blue available in SharePoint was used to unify the page and match the KLM brand. Rather than content spread all over the site, the new layout allows the user to focus on content that is centre aligned. The margins allow the user to focus on the centre which is what wants to be shown. The site looks therefore more flexible and organised.

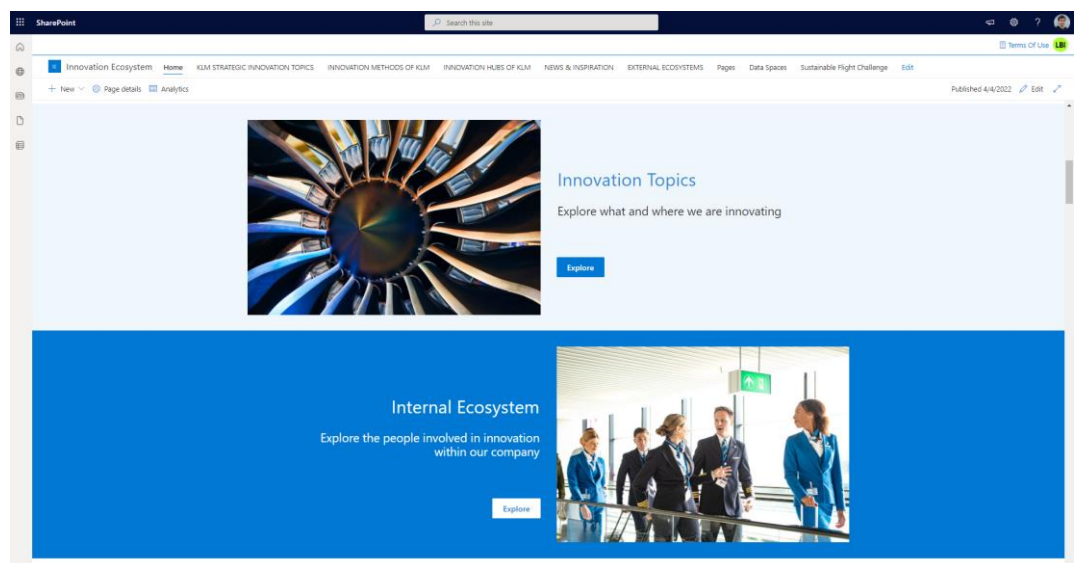


Figure 31. Screenshot of the new layout first two elements

Images available for public communication were used for the site. The images match the topics and allow the users to recognise the topic (Figure 31). Full-screen images were used as a transition means between content. The font used is Segoe UI, KLM's choice for digital purposes when the original font is not available.

The site matches the digital brand identity and allows the user to focus on the content by narrowing down the elements shown, making elements bigger and playing with blank space to let the user scroll and spend more time visiting the innovation platform.

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## 8. Identify the cultural brokers

In the last two chapters we have been able to see the development process of a digital tool and the place where innovation related knowledge is found. These can be helpful but are systems to the organisation. From Chapter 5 we know that if we are to propose a meaningful change in innovation and collaboration, several areas of the organisation have to be involved. The 7S framework helped in categorising the areas. Constraints and criteria helped to select other interventions in alternative areas tried recently and successfully by other corporations.

From Chapter 2, we know about the cross-departmental collaboration issue at KLM. The company's core competency is and has always been operational excellence. Collaboration barriers have raised given its geographical distribution and the number of employees (+28.000), among others. The causes are that employees do not know or want to know what is happening away from their workstation (Chapter 3). It is an issue that affects other divisionalised organisations of this calibre and especially in industries that are scale-intensive (Mintzberg, 1979).

From the research conducted in Chapter 2, we know about the modern models of innovation. The complexity of the current business environment is one of the reasons that has meant that companies now innovate in networks. Within companies, innovation initiatives have to break down silos and share common boundaries. Sharing of knowledge and collaboration becomes a challenge in companies that at the same time need focus for their day-to-day operations.

In the past, at KLM the barriers have been dealt with twofold. Employees have used their phone to reach a colleague and ask for reference for other colleagues of the topic they need to inform themselves. Another way is that employees have asked their direct manager. We know that a culture of innovation has to allow horizontal communication rather than rely solely in vertical relationships (Markman, 2014).

Developing cultural brokers, or employees that have the ability to connect across silos and departments, is one of the interventions that can help in avoiding the vertical structure of the firm and connect employees with new pools of expertise to learn from them (Edmonson et al., 2019). The intervention aims to create a culture of innovation by fostering collaboration among units. This culture will set the ground for a soft landing of the innovation ecosystem concept.

## 8.1 Cultural brokers: introduction

Nowadays innovation requires from horizontal collaboration. From the trends in innovation models explored in Chapter 2 we are aware of how important other parties are for the innovation to succeed. These parties are often not before or after, or above or below, they are aside. The innovation requires the actors to cooperate while at the same time focus and deliver on what they can already do well.

Focus raises barriers and creates subcultures. Barriers can be lowered with a formal restructuring of the organisation. Silos can be broken down by modifying the organisational structure. The problem is solvable, but risky. A formal restructuring can have an impact on the budget and in particular, on the many other tasks that are successfully conducted. New problems that could arise from such transformation are now unknown.

Fortunately, there are individuals who already excel at interface collaboration among units (Markman, 2014). These individuals are called brokers. Sociology names as “broker” the individuals that can act as a link between isolated groups or individuals, so that the transfer of goods, services or information is enabled (Britannica, 2007). In siloed organisations, brokers excel at bringing people together (Markman, 2014). Different kinds of brokers can help connect divisions, departments, areas of expertise, or even geographies.

### Structural hole

A structural hole is a gap in a network between two actors that have complementary information (Burt, 1992).

Not everyone has to be a broker, but identifying them can help. Brokers enable transfer of knowledge by having the capacity to exchange contacts or information with a variety of stakeholders. What is more important, they do not disrupt the activity that these stakeholders are carrying out. A broker is or should be available for request, but can also initiate a possible collaboration if they see the potential synergy.

Below are a set of statements that show how brokers could be particularly helpful. The reference for the first two statements has been Burt and his studies on social networks and innovation (1992; 2004).

**Brokers can combine ideas.** Brokers can combine inputs to solve problems or kickstart an innovation. Receiving ideas and knowledge from different sources can allow the individual to combine them into something useful that would have been impossible without the combination (Burt, 2004).

*“People with connections across structural holes have early access to diverse, often contradictory, information and interpretations, which gives them a competitive advantage in seeing and developing good ideas (Burt, 2004, p. 388).”*

These individuals are in an advantaged position to the development of the innovation and, if nurtured, their potential and knowledge can be transferred to other parts of the organisation.

*“Managers who broker connections across structural holes in their organization are more likely to have good ideas (Burt, 2004, p. 388)”*

By identifying them, we can know who has the access to the original sources of new ideas and knowledge.

**Brokers can connect stakeholders.** Brokers can connect the actors that are needed for a certain innovation to thrive. Their in-between position allows them to be able to gatekeep valuable information (Burt, 1992). Burt, in the implications of his study on creativity, argued

in favour of the value of an idea residing in the situation and transaction through which the idea is delivered. The value is not in the creation, nor in the idea itself, but in the connections that allow the idea to thrive. Brokers and the process of brokerage play a central role in how new ideas are turned successful.

The broker, from his advantaged position, can reflect and realise the multiple sources that are essential for the innovation to be successful. The broker is now able to create the necessary connections for the innovation to thrive.

If we translate this to an innovation ecosystem, the value of an idea that could be translated into an innovation within the ecosystem is in the connections. The more connections, the more the idea is delivered, the better and more valuable it will be. And brokerage plays a crucial role in creating connections (Burt, 2004).

**Brokers can strengthen the ecosystem.** Brokers can strengthen the relationships in a given innovation ecosystem. As brokers are the ones who have the social knowledge, stronger and more frequent relationships can arise from allowing them to connect isolated groups of people. The isolated groups in siloed organisations can be divisions or individuals whose knowledge is valuable but only the broker knows about. The brokers facilitate cross-divisional collaboration by strengthening the relationships in the innovation ecosystem.

Having seen how identifying and developing cultural brokers can be helpful, the next step will be to identify a sample of them at the organisation.

## 8.2 Identifying the cultural brokers

Brokers can be easily identified by having a map of a whole network as the ones that connect groups or individuals that are not connected to each other. Several methods exist to map networks. Nevertheless, classic methods of social network analysis (SNA) can be time consuming and costly. The researcher may have to interview the totality of the network to build an accurate representation. Fortunately, new methods are arising from recent research that allow for accurate results with less effort. For this intervention, a novel network analysis method was used that is applicable with the time and resource constraints of the project. The method was developed in a dissertation by Celik and is the main reference throughout the section (2018). In the next part, the method is explained while showing the results of its application.

### 8.2.1 Method and Results

The 'Network Representative Method' (NetRep) is an approach to mapping large-scale networks that relies in the input of a few representatives of the network to form an accurate map (Celik, 2018). By selecting and interviewing a few actors that can act as representatives –representing the whole network– the map is built. The method avoids contacting the whole network, focusing on the actors that have the overview and can save time and effort (Celik, 2018).

The method has several steps that were applied during the project. Given the in-depth study of the method presented in the dissertation, some parts of the method were simplified for it to be applicable during the timeframe of the project. The essence and value of the method remain the same, and additional limitations that may arise from not adopting the original method are presented at the end of the section. The steps are:

**1. Identify the network and network boundaries.** The first step is to identify the network and boundaries in which the brokers are to be identified. Due to potential issues in confidentiality and privacy, the project constrained the scope of the innovation ecosystem to only internal employees. The boundaries rely therefore within the organisation.

The network in which the brokers were found was an innovation network. Several types of network exist, such as friendship, political, or managerial networks. For the context of the project a network related to innovation was chosen. Having had experience with innovation projects, past successes or failures, being involved in the application of new technologies, being part of an innovation hub, or having contact with an external partner or knowledge institute with which new applications or knowledge will be implemented are all characteristics that help in defining the type of network.

**2. Identify the representatives.** The second step is to identify the actors that due to their experience or knowledge can be representative of the whole network. Criteria for choosing the representatives has been the following:

- Ability to provide reliable information about the network
- Ability to justify their prior knowledge of the network
- Availability
- Commitment to privacy

After selecting the criteria a set of representatives were selected to continue with the process. The criteria were discussed with the company mentor and together drafted a list of potential candidates that meet the criteria. The following candidates were selected:

- *Representative 1.* The first representative has been working at the company for almost 25 years. He is involved in planning trainings and lectures to the organisation on a list of

technology-related topics. He has been selected for his background and cross-divisional experience.

- *Representative 2.* The second representative is involved in strategic planning in the organisation. He has been involved in deploying the corporate strategy having contact with the majority of business units. He has been selected for his cross-divisional activity.

- *Representative 3.* The third representative has worked at the organisation for more than 20 years in human resources. Her involvement in such a central function and knowledge of employees positioned her as a qualified representative.

Once the representatives have been identified, an interview was planned with each of them to gather their 'network' knowledge and identify the cultural brokers.

**3. Interview the representatives.** The representatives were approached to have a semi-structured interview about their network and the innovation ecosystem at KLM. Interviewees were asked to sign a consent form with the purpose of the interview and accepting the storing of data as a result of it. During the interviews, the method originally developed by Celik is simplified. The representatives are explained the concept of cultural broker, and asked whether they can identify a number of employees that could potentially fit within the profile of a cultural broker. If the interviewee struggles, a list of names of employees is given to facilitate their identification of the broker profile. After explaining the concept, the questions asked were:

- *Whom do you know that has had cross-divisional and/or cross-departmental experience at KLM?*
- *Whom do you know that has connected groups that were unknown to each other? How often does that actor play that role?*
- *How is your relationship with that actor? Since when do you know each other? How often do you meet?*

The answers given allowed to draft a list of names for further analysis and compare the names within representatives. The next section continues by identifying examples of cultural brokers from the given names.

**4. Identify the brokers (validation).** Each representative proposed a set of names that from their perspective fitted the description of a cultural broker. The answers were validated by comparing the input coming from the representatives. If a representative proposed a name that neither of the other representatives had proposed the name was discarded as considered not reliable enough. Table 13 shows the list of potential brokers provided by the representatives. Their names have been modified for them to remain confidential. The numbering starts with the first representative.

Table 13. Brokers identified by the representatives

Representative 1	Representative 2	Representative 3
Broker 1	Broker 1	Broker 15
Broker 2	Broker 11	Broker 2
Broker 3	Broker 12	Broker 16
Broker 4	Broker 4	Broker 17
Broker 5	Broker 5	Broker 18
Broker 6	Broker 13	Broker 19
Broker 7	Broker 14	
Broker 8		
Broker 9		
Broker 10		

After comparing the list of names and the explanations given by the representatives, a list of four brokers was selected for being named by more than one participant. The goal is to use the selected brokers as an example to explain the concept and their prior behaviour for being tagged with such role by the representatives.

### 8.2.2 Discussion and Conclusion

The last intervention consisted of identifying a type of actor within social networks that is characterised for his ability to connect groups of (isolated) people. According to Burt's studies on networks and innovation, we are aware of the potential these actors can have when combining ideas and strengthening the ecosystem (1992; 2004). Studying the totality of the innovation network at KLM would have been impossible with the use of classic descriptive methods. Fortunately, the 'NetRep' method developed by Celik (2018) allows to gather accurate results without interviewing the whole network. The method relies in interviewing only a few representatives of the network that can provide the same or similar results.

By interviewing three stakeholders popular for their background and cross-divisional experience, a set of five actors that can be described as brokers were identified. Without taking the exact name of the brokers, the concept can be better understood by reflecting on their experiences and how they performed to be named brokers by the representatives. Moreover, the organisation can use the same method in the future, in case certain departments have to be connected, or silos have to be broken. The simplified method presented in this chapter allows to identify a group of brokers to foster cross-divisional collaboration, especially when the implementation of the innovation ecosystem has to become tactical enough to connect groups of stakeholders.

Nevertheless, the method has its limitations, both in its original form and how it has been applied here. For a more extensive reflection on the limitations of the NetRep method I refer to the work by Celik (2018). For the method developed in this project two particularly important limitations are:

**The method relies on the network of the representatives.** The representatives are approached because their experience and knowledge of the network is representative of how the actual network is. This assumes the real network and the representation owned by the representative are the same. It is possible that a gap exists between these two and such gap has to be acknowledged when promoting the role of brokers.

**The method relies on the example brokers given by the representatives.** The interviewees were explained the concept of cultural broker. The method assumes that both the interviewees understand the role of brokers and that during the timeframe they are asked they can provide every broker that lies within their network. It is a possibility that some example brokers are left behind, or even that some brokers given do not precisely fit the definition given. To overcome this, the representatives are asked about the background of the broker, and the results compared among representatives.

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## 9. Conclusion and recommendations

This chapter concludes on the research and development process during the project and recommends the actions that need to be taken to continue with the knowledge gathered. First, a summary and answer to the research and key questions of the project is given, followed by a reflection on the process and main contributions of the thesis.





## 9.1 Summary and answers to research and key questions

The nature of activity of the airline industry brings complexity to the innovation activity. Efficiency and safety are two key aspects that allow the carriers to effectively translate their operations into profit. Risks have to be avoided. Innovation, often incremental, is not impossible, but challenging.

KLM is the flag carrier and biggest airline in the Netherlands. Examples of innovation cases show the multidisciplinary background of those who participate, joined with the need to bring some of the knowledge created during innovation to other divisions or units within the company. The innovation management team, operating from the headquarters, is the team responsible for overseeing the innovation processes that actually take place in the business units. The team plans trainings, and helps find synergies between the units with the corporate strategy in mind.

In 2019, the innovation team at KLM started to be aware of the opportunity of innovating as an 'ecosystem'. After several efforts, such as explaining to the workforce what ecosystems are via masterclasses, the assignment of this thesis stated the need for a digital product that can interactively represent the actors involved in the different ecosystems within the company. The assignment came with an implicit set of assumptions. To gather a broader understanding, three research directions were stated. These directions, represented by research questions, were selected to combined the theory, practice and holistic intra-organisational perspective needed to understand the assignment in depth and reframe the problem.

### *Answer to RQ1*

#### *Why should organisations consider innovating in networks?*

In the present complex and competitive business environment, networking models of innovation allow the actors involved to both focus on what they excel at, while collaborating, transferring knowledge, and diversifying the risk of the innovation among the rest of the participating actors. The models of innovation networks are an evolution of how innovation has been represented in the past, such as linearly in market pull models or in parallel with alliances, and represent how businesses and institutions should innovate nowadays.

### *Answer to RQ2*

#### *What do employees think about the concept and implementation of the innovation ecosystem?*

The sample of employees interviewed state what the focus of KLM is: execution. Execution has raised barriers between departments, and the habit of collaboration to use existing knowledge or technologies is missing. Some employees are aware of the current barriers, but are also enthusiastic. They are aware the future of KLM will need of cross-divisional use of technologies that are necessary for more than one business unit. Barriers and opportunity coexist at the same time in employee's minds.

### *Answer to RQ3*

#### *Is the organisational culture ready to adopt a new ecosystem/network mindset?*

From a holistic perspective, the culture values efficiency, shows formality and structure, and assumes productivity and responsibility often reside in silos or in hierarchical managers. This is understandable given the background and history of the organisation, and the proficiency it has reached in its business segment. Nevertheless, there is room for improvement in having an ecosystem/network mindset to carry out innovation activities in the future.

The research conducted showed the underlying problem is not one of missing digital functionalities or interactive representations, but inefficient collaboration among units that could impede the

implementation of the innovation ecosystem. When it comes to collaboration, insights from the research were categorised into three reasons employees may have to avoid collaboration: either they do not know who is at the other side of the barrier, they do not want to, or simply cannot. In this sense, developing a digital product can help tackle the last cause, but is only one of the interventions needed to effectively implement an ecosystem mindset, foster collaboration, and see frequent transfers of knowledge and innovation cases throughout the organisation.

In this direction, we phrased a new key question which guided the development process. As we remember, the goal of the project was not only to inform, but to provide practical output useful for the innovation team and KLM. The reflection after this summary section explains why in particular this can be relevant for them.

#### *Answer to key question*

##### *How should KLM develop interventions to implement the innovation ecosystem while facilitating cross-divisional collaboration?*

Interventions should be broader, that tackle the different causes and address different areas of the organisation. The 7S framework was chosen given its past usefulness for similar purposes as a model to categorise the different areas of an organisation. For example, we may need systems, skills, and staff interventions. But also be aware of how each intervention influences the rest: structure, strategy, shared values and style. After researching best-practice example cases, we developed three different interventions during the timeframe of the thesis.

#### *Intervention 1*

##### *Design a tool that represents the actors involved by innovation topics*

A digital, interactive tool can help in facilitating connections among and outside a certain ecosystem. Users throughout the organisation can now, with a couple of clicks, see who is involved in a certain innovation project or topic, and doing what. This is assumed to facilitate new relationships, in which transfer of knowledge and shared use of technologies is more frequent.

The development process had to make use of Microsoft's input to find an appropriate software to support the tool. An iterative design process found Power BI as the most suitable option from the Power Platform solutions. This project has expanded the possibilities of use Power BI has as a software. Creating the tool required tinkering and creative thinking, and a manual on how the tool works was handed in to the company, attached in Appendix 2.

#### *Intervention 2*

##### *Organise the knowledge required for innovation activities at the organisation*

Finding the tool required an organisation of the innovation knowledge-management system. Moreover, it is assumed that having a clearer, structured information architecture in which old innovation projects, innovation methods, and partnerships with external parties are available for the organisation would help in the ecosystem goals of sharing knowledge, use of technologies, and contact with external parties. These were newly designed and integrated into the company's innovation intranet in SharePoint.

#### *Intervention 3*

##### *Identify the cultural brokers that can connect groups of employees with an innovation purpose*

Finally, people are needed to actually connect and collaborate. Brokers, by definition, connect groups of isolated employees within a network. A novel method to identify brokers was used, in which five names were found to be actual brokers at KLM. Not the names but the method are meant to be important. The method is relevant to find future brokers that can help connect silos or departments and transfer knowledge needed for a certain innovation to thrive.

The three interventions gave a broader approach to the complex problem of collaboration and innovation at a large organisation in the airline industry. Additional interventions in areas which have not been covered in this thesis will be needed to see KLM's employees' innovating in networks. This thesis has contributed a valuable approach to finding interventions but further effort is needed to see the interventions started in this thesis show their full potential. The next section reflects on the methods, approach and interventions pursued, and how these may have contributed to the goals of innovation at KLM.

## 9.2 Reflection and main contributions

### **On the complexity of the issues covered**

What seemed an apparently simple assignment has been turned into the complex goal of achieving efficient collaboration with an innovation purpose at a large organisation. These are high-level terms which bring complexity when attempting to achieve a goal in particular. Implementing an ecosystem way of thinking, with frequent transfers of knowledge, touches upon fields of expertise that would require of more than one research project to bring concrete answers to. It would remain even a challenge for a longer project with more abundant resources to propose a solution to the issues covered in this thesis. What we have tried to contribute is that it is possible, with small interventions, in different areas of the company, to tackle the issues with the same goal in mind.

Upon the stated problem of inefficient collaboration with the ecosystem goal, the thesis developed three interventions which, judged by criteria and constraints, were feasible to be developed during the project. It is possible to, with the methods and approach shown in the thesis, to find new interventions that can help KLM's departments and units to innovate in networks. We need to address three causes. Why would employees want to collaborate with these new intervention? Do they know who is behind the barrier with a promising technology? Are we facilitating the connection? Or only remunerating on execution? These are questions which may be relevant to have answered when proposing interventions to implement the ecosystem. Moreover, we need to be aware of how the interventions relate to other areas of the organisation. Are we improving skills? Do we need new staff? Or is the structure not functioning properly? The thesis contributed with broader awareness to causes and areas of a complex task, and proposed interventions instead of solutions, to help KLM in intra-organisational collaboration.

### **On the methods used**

The thesis brought methods from scientific literature, iterative design processes, and advisory consultancy frameworks, among others. Each of these very different sources have contributed with their specific added value, being for example the reliability of scientific research or the experience of consultancies in gathering business best-practices. Although better methods could be found, during the timeframe of the project we recognise the ability to bring in different perspectives. These perspectives contribute to an issue that requires a wide variety of experiences to provide actual interventions that can help us get closer to what we aim for: an effective and efficient innovation ecosystem. In other words, we may need to hear from researchers, consultants, employees, or simply iterate on the intervention to innovate in networks.

### **On the innovation team**

Being indirectly responsible for innovation at a large organisation is a challenge. Managing innovation from headquarters and not from the ground floor means assistance is expected. But the line between assistance and commitment or responsibility is often blurred. This means the innovators from the business are frequently uncertain of what to expect.

The research and interventions developed during this thesis can help in the future tasks the team will need to carry out to implement the innovation ecosystem and foster collaboration. From the research phase, we may now understand what the added values of the networking models of innovation are. We are also aware of what employees think, the culture and background history of KLM. To intervene, we should not forget the three causes that hinder collaboration at the company. Interventions should include a holistic understanding of which organisational areas are being changed, and which ones only influenced. We may propose a new system, but are the shared values already in place? The thesis aimed to bring both clarity and practical output, and the approach can be valuable to continue with the efforts.

Furthermore, there is a specific responsibility of the innovation team where the interventions can have a protagonist role. The team is responsible for finding synergies, connecting departments and connecting with external partners, such as knowledge institutes with an innovation purpose. The thesis developed a tool that facilitates creating connections. If the tool is taken care of, with updating and maintenance, the platform where employees can share their contribution and find peers is now available. The tool, in sum, can facilitate the responsibility of the team.

On the other hand, collaboration is a people task. Understanding the concept of brokerage in innovation may help in finding the next contact person to connect those two departments that have complementary skills, for example. Additionally, the team may develop an eye for discovering structural holes which are detrimental to the innovation activity, and propose a broker to take care of the connection and collaboration of those isolated groups. The original method, adapted in the thesis, is valuable for finding brokers who can help in the tasks given above.

To conclude on the limitations of this thesis, we may remember the limited resources and time this thesis has had to both research and develop interventions. These interventions need of further work, and the methods may be reused, but possibly new undiscovered methods and interventions may be found in the future to accomplish the goals. Nevertheless, every intervention should have in common a broad approach to the causes and areas of the organisation, approach which has been developed during this thesis.

### **On change and transformation**

KLM is a leading airline in the industry who has pioneered initiatives which have influenced how the industry operates. This thesis has been developed from the argument that collaboration and innovation may be of a more difficult challenge in organisations that depend on execution and safety in their operations. The contributions of this thesis do not aim to disrupt nor transform how the organisation operates, but to add a certain set of interactions, supported by systems or staff, that can work together with how KLM is currently run. The goal is to help KLM use the advantages of (intra-organisational) collaboration and networking to be more innovative and pioneer sustainable aviation, while allowing the organisation to continue to execute the processes that have kept it alive, operating and competitive.

### **On feasibility, desirability and viability**

A number of accomplishments and downsides are highlighted during the course of the project. On feasibility, the project had to establish close contact with external partners to ensure the systems become feasible. Learning from senior developers and account managers on how to identify a software solution that could perform the functions required by the users was key to the feasibility of the first two interventions. Further, now individual, efforts during the thesis expanded what the original software chosen is able to perform. Power BI is now not only a solution to build dashboards, but interactive toolsets for the organisation to use.

If such effort was needed to tailor the software from an external provider to the requirements of such a large organisation, one may speculate on the suitability of the original software. This aspect

may be addressed in the future, for the moment the thesis had to make an extra effort to redesign and expand what the predetermined functions of SharePoint and Power BI were.

Regarding the last intervention, the selection of a suitable method allowed the thesis to showcase the individuals who excel at lateral collaboration. Conducting complex social network analysis during the timeframe of the project was not an option, and selecting the 'NetRep' method as a shortcut to find cases of brokerage helped in turning the intervention feasible, acknowledging the limitations of the method.

On desirability, we may acknowledge the absence of real users from the systems developed. The thesis established regular contact for feedback with potential users and individuals from different departments. The innovation team is impressed and expert design teams, such as the customer experience team from KLM, have been involved during the design process. The systems are usable and desirable from the setup of the testing sessions, but finding real use cases and answer the when and how of using the tool needs of practical experience the project has not been able to accomplish. Finding real use cases and answering these questions may need from first selecting a suitable project and finding stakeholders willing to contribute. This may have slowed down the development process and the argument is in favour of conducting a pilot once having a usable version of the tool. The pilot, with the commitment from a group of stakeholders, may allow the tool to find the exact occasion on when and how it can become more useful. The manual of the tool in Appendix 3 proposes several answers to the when and how of using the tool, but these will only be proven with real experience and a pilot is recommended as a next step for the project.

Finally, on viability, it is a challenge for an organisation to update and maintain the systems developed and extra effort is required to build accurate representations of ecosystems and updated knowledge in the intranet. Fortunately recently, a new full-time employee has been appointed to the innovation team, and will take responsibility of the systems developed during this thesis. Special effort on handing over the knowledge gathered, with one-on-one sessions have been conducted. If future staff changes may arise, the thesis provides a manual with step-by-step advice on how to use and build the tool. The goal has been to facilitate that KLM makes use of the systems developed, and increase the viability of the first two interventions.

Nevertheless, as the approach of the thesis showed, every intervention becomes more viable if the effort is accompanied by cross-divisional action in other areas of the organisation. Finding a new value proposition for identifying brokers and connecting people within the company has helped in increasing the viability of the initial assignment in alignment with the goals of the organisation to innovate as an 'ecosystem'.

## 9.3 Recommendations

To continue, three recommendations are given to the innovation team and the organisation. The recommendations include a new piece of advice, adding to the continuation of the interventions pursued, that will help to align and clarify the role of the stakeholders in the innovation ecosystem. This new step is assumed crucial to allow for the rest of the efforts to function.

### 9.3.1 Define ecosystem governance

Before diving into the implementation of the systems it is necessary to align the stakeholders involved. Defining a part of the ecosystem's governance can help in aligning expectations from those involved. Afterwards it will be the best moment to continue with implementation efforts. The definition of governance that is addressed in this piece of advice is not meant to be complete, but a starting point. With governance we here include the rules that define the behaviour of stakeholders within the ecosystem (Britannica, 2006); the norms that allow it to operate; the criteria to include the ones involved within a particular ecosystem; and the expectations from them.

To aid defining governance, a framework is proposed that can help in starting the discussion. Searching for a suitable and specific framework can be a complicated exercise. In this case, the experience from management consultancies in dealing with large business was prioritised as a source. A brief search identified several frameworks from top management consultancies. The selection was made on the criteria of research conducted before building the framework. Boston Consulting Group's (BCG) strategic think tank, the BCG Henderson Institute, conducted research with more than 80 ecosystems in place to define governance (Pidun et al., 2021). The framework result of the research has been assumed as reliable and helpful for the organisation of this project to define its own governance with its own ecosystem. The elements and key questions of the framework have been slightly modified to the topic of innovation and the intra-organisational context of the company and can be seen in Table 14. Further elaboration on the questions is provided in Appendix 4.

Table 14. Governance framework and questions

Elements	Key Questions
Mission	What is the purpose that aligns the actors within the ecosystem? What are the common set of values that guides them?
Access	Who can participate in the ecosystem? Why is this stakeholder needed to carry out the purpose of the ecosystem?
Sharing	How is the development of the ecosystem topic shared among stakeholders? Does everyone have access to the same information in the ecosystem?
Participation	What level of commitment is required from the stakeholders in the ecosystem? How are conflicts solved and who is responsible?
Recognition	How is the quality of the contributions of each stakeholder judged? How is the value created by the ecosystem recognised among stakeholders?

Source: Adapted from BCG Henderson Institute

The framework is recommended to be used during a meeting with a small group of representatives from the ecosystem. The representatives should represent different profiles of stakeholders

involved, from technologically savvy to senior level managers, and from critical to enthusiastic in innovation and collaboration. The discussion can be triggered by the questions stated in the framework. Element by element, the discussion should answer the key questions proposed and align the participants of the meeting. The outcome should be, with the questions answered, clearer expectations and rules from those involved, that can now be disclosed to the rest of the ecosystem and continue with the efforts in implementation of the systems.

### 9.3.2 Plan system's implementation

With governance defined, the development of the first two interventions can be continued with implementation. Since the interactive tool is the most complex system which will require training, the advice of this section is targeted to it but applicable at the same time to the knowledge-management system. The final development steps left the tool in a usable state. It is now the moment to add the practical experience it requires for refining its value proposition. A roadmap is given to allow the systems to become gradually available in the organisation. The roadmap provided is in a short-term timeframe. The licenses the software requires are paid on a monthly basis, and not more than three months are expected to give valuable feedback on the use of the tool.

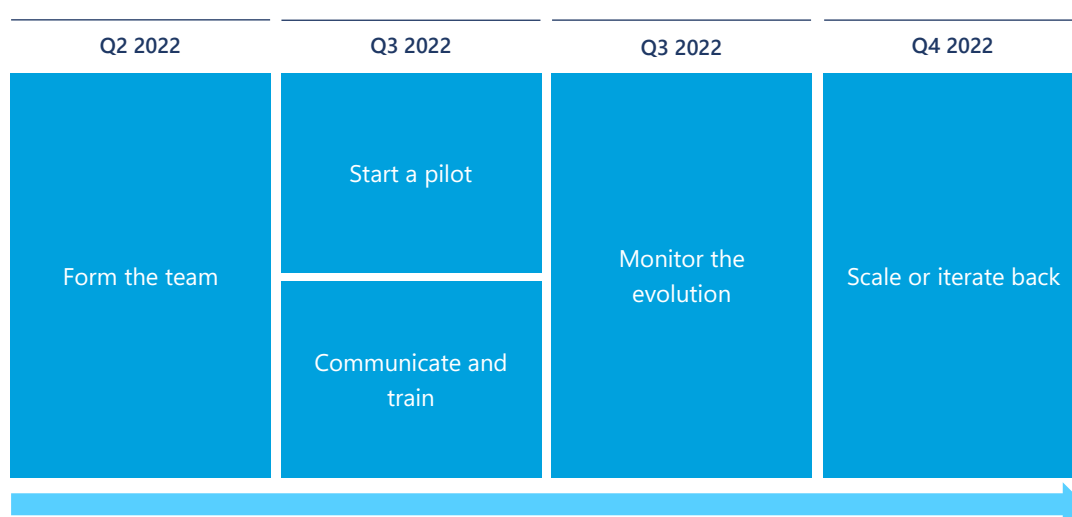


Figure 32. Short-term roadmap for system's implementation

#### Form the team

First, a team must be composed that includes the roles of 'sponsor', 'champion', 'manager', and 'integrator' (Leonard-Barton & Kraus, 1985). The roles are elaborated in Table 15. The tool, during the timeframe of the thesis, has been pitched to a senior vice president, and the granting of licenses for the stakeholders involved approved. It is also recommended to involve, apart from the four roles, key individuals who may have a crucial role in implementation. During the project, close contact has been established with technical specialists and vendor managers, who can support the users in the future. These are an example of stakeholders worth to count with during implementation. Furthermore, a person technically responsible for the tool must be selected. During the last weeks of the thesis handover sessions have been held in which the tool has been explained. It is expected if the responsibility changes in the future to count with the handover effort of these sessions to the newly responsible. To assist on that, a manual of the tool can be reviewed in Appendix 3.

Table 15. Four roles in implementation teams.

Role	Description
Sponsor	A senior manager who is knowledgeable about the politics of the organisation and can ensure the allocation of resources
Champion	An enthusiastic stakeholder who can provide the motivation and vision the implementation requires
Project Manager	A manager that oversees the administrative procedures
Integrator	An integrator understands and connects the necessities of the different groups towards the most viable solution each time a decision has to be made

Source: Leonard-Barton, D. & Kraus, W. (1985). *Implementing New Technology*. Harvard Business Review.

### Start a pilot

For that, the resources have first to be limited and conduct a pilot in which learning from a real use case can be gathered. The tool is usable and accurate feedback has been already gathered on they key potential issues, but real use case experience is needed to refine the value proposition. During the timeframe of the project it has not been possible to test when and how the tool might be more useful for stakeholders. Participants from feedback sessions have been enthusiastic about the use of the tool, but real experience is needed to prove whether they would use it and under what conditions.

For this purpose, a pilot in which a certain innovation ecosystem is established in parallel to the use of the tool is the most accurate method to gather feedback. After discussions with the innovation team and senior management, the decision for the pilot project is to test the tool in 'Zero Emission Aviation'. The Program Lead in charge of the project has approved the use of the tool, and the first project-based ecosystem has been added to the tool. The innovation team is therefore asked to continue testing the tool during the project. Users from the company must be provided with licenses, and frequent surveys and interviews recommended to be gathered to learn from their experience. Before that, the users involved need to be shortly trained about the use of the tool.

### Communicate and train

Short sessions in which employees are introduced the tool, the vision, and how helpful the tool can be must be conducted. The manual in Appendix 3 can assist in that purpose. Employees must try first person how the tool adapts to their own needs. Recently onboarded employees might rely on the networking side to meet new colleagues, while experienced managers might take advantage from the cross-divisional perspective the tool allows. Each user must find how the tool adapts to their own daily workload and support will be needed for that. A sense of urgency (Kotter, 1996) might be created with the results of the research conducted during the thesis. Nevertheless, it is important to state clearly what the tool can and cannot do. For the tool to be successful, the stakeholders represented in the tool have to be relevant to the innovation process and willing to contribute. Otherwise, having a better representation would be useless, since the stakeholders are not helpful from the start.

### Monitor the evolution

Once the pilot has commenced and the stakeholders involved have been trained, it is time to monitor the evolution of the tool. A special attention must be given to how the users utilise the tool. Assistance and additional training may be needed for those stakeholders with low digital literacy. Stakeholders must be asked for their background to the topic of the ecosystem, skills, expertise, and willingness to contribute to the development of the tool. The information can be



added to the digital system for others to revise and consult when needed. In parallel, both quantitative and qualitative research may be needed to accurately understand employee's experiences. For the former, surveys with questions can be provided to the ones involved every two weeks. For the latter, at the end of each month qualitative interviews can be conducted with a sample of stakeholders to deeply dive into their experience. The research and monitoring phase will help in deciding whether to iterate on the development of the tool or scale to larger projects.

#### **Scale or iterate back**

If results are positive it is recommended to scale the use of the tool to a different project within the company. A similar project with a different team, that includes the same roles, can be searched for. If results include aspects to improve, it is recommended to iterate on the aspect that needs improvement. Different areas of expertise may be needed depending on the outcome, and the team should remain open to new issues and assign responsibilities accordingly. The holistic approach given during the thesis and the use of the 7S model may be of assistance when judging the outcome. All the areas of the organisation should be aligned towards the main goal of collaboration and innovation as an ecosystem.

### **9.3.3 Nurture the cultural brokers**

Finally, the third intervention showed the importance of brokers in social networks that need from collaboration with an innovation purpose. Burt's studies showed the dual role that brokers can have (1992, 2004). Brokers can connect isolated groups of employees and combine ideas from different input groups to propose something new. The role provides them with a competitive advantage in the network. The advice given in this last recommendation is twofold.

#### **Involve brokers in ecosystems with structural holes**

On the one hand, involving brokers within ecosystems and being aware of their role can help the ecosystem become more connected. Explaining the role of brokers to the manager or innovation team member at charge can help in identifying the stakeholders needed to connect two divisions or departments in which a cross-divisional synergy has been identified. If two or more isolated departments are crucial for the purpose of the ecosystem, the team is recommended to use the NetRep method to identify brokers that can connect those groups of stakeholders. The brokers may not only facilitate the connection, but the mutual understanding and prediction of potential issues that may arise after connecting them. The broker will have had prior experience dealing with the groups and is in an advantageous position to recommend what needs to be done.

#### **Interview brokers for creative input**

Brokers receive input from different sources that can allow them to become more creative (Burt, 2004). After identifying the brokers within a given ecosystem, these can be regularly interviewed to discover issues on the performance of the ecosystem and propose how to solve them. Brokers may have already an above average understanding of the stakeholder's concerns, and valuable ideas on how to continue. Brokers can be interviewed to plan subsequent action towards the ecosystem's innovation goals.

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# Appendix 1 – Interview Guide

## Introduction

Introduce yourself. Explain the graduation project and purpose of this interview. State that anything the interviewee responds is valuable.

## Questions

1. What do you know about the innovation ecosystem at KLM?
2. Have you tried to create (or been part of) an innovation ecosystem with the PowerPoint template?
3. How is your experience when checking the innovation ecosystem? What do you usually look for?
4. What do you think slows down the use of the ecosystems to know more about other people in the company? What are the barriers?
5. If you have participated in an innovation project across two or more departments: How is the relationship with other divisions/departments regarding a common technology/process/innovation project?
6. Recall the last time you wanted to know more from someone in the company, what did you do?
7. What do you think is most interesting for you to share with others (in the ecosystem)? In case you are an expert or own a technology within the company, so that they can also benefit from your knowledge

## Ending

Ask if there is something else they would like to add to this interview. Ask for follow-up and participation in future research.

# Appendix 2 – Informed consent form

## INFORMED CONSENT FORM

### ADRIÁN ESQUINAS – GRADUATION PROJECT – KLM & TU DELFT

You are being invited to participate in a research study that consists of personal interviews. This study will be conducted by Adrián Esquinas from the TU Delft and the Radical Innovation (RI) team from the Transformation Office at KLM Royal Dutch Airlines.

The purpose of this research study is to understand the experience behind the current innovation ecosystem orchestrated by the RI team from a users' perspective. Interviews will take approximately 30 minutes to complete. The data will be used for the documentation of the new design of the innovation ecosystem. In the interview we will explore your current experience with the ecosystem and how you think its use could benefit KLM's innovation as a whole.

As with any online activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. We will minimize any risks by anonymising the results and storing every information related to the research in the safe intranet from KLM.

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any questions.

For any other question, you can contact Adrián Esquinas via e-mail ([Adrian.Esquinas@klm.com](mailto:Adrian.Esquinas@klm.com)) or phone number (+34 687 65 25 46).

Please tick the appropriate box at the bottom of the page

- |   |
|---|
| 1. I have read and understood the study information dated 08/02/2022, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.  |
| 2. I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.   |
| 3. I understand that taking part in the study involves an interview with the researcher of approximately 30 minutes, and that this interview will be recorded and transcribed as text. I understand this transcription will be destroyed at the end of the project. |
| 4. I understand that the data result from the research will be safely stored and anonymised, and protect my identity in the event of a breach.  |
| 5. I understand that personal information collected about me that can identify me, such as name or job position, will not be shared beyond the study team.  |
| 6. I agree that my job position or department can be used for quotes in research outputs  |
| 7. I understand that the (identifiable) personal data I provide will be destroyed at the end of the project.  |
| 8. I understand that after the research study the information I provide will be used for the documentation of the thesis project, and due to TU Delft's policy this thesis will be made public.   |

Name

Date

Signature

Yes  
☐

No  
☐

## Appendix 3 – Manual of the tool

## Appendix 4 – Governance framework

The governance framework is divided into five elements. Each of these elements address a phase in the development of an ecosystem, from establishing a mission to defining how recognition is shared among stakeholders. Below I describe what is intended to achieve with each of the elements. The innovation team is recommended to host a meeting with a set of representatives from each ecosystem to answer a number of questions provided with the framework. Every group involved in the ecosystem should have a representative person that gives voice to their concerns and ambitions.

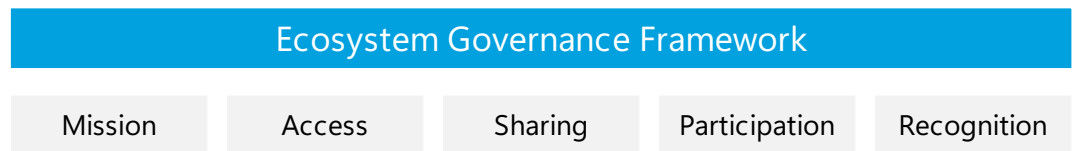


Figure 33. Ecosystem governance elements

Source: Adapted from BCG Henderson Institute

**Mission.** The mission defines the goal of the ecosystem. Is the goal a new innovation project? Spreading knowledge about sustainable practices? Representing a central function such as human resources? The rest of the elements of the framework vary according to the goal of the ecosystem. It is also recommended to define the culture of the ecosystem with a set of values. Agreeing on the values at this stage may help deciding who can and cannot join as well as what is expected in terms of participation.

**Access.** The next stage is defining who can access the ecosystem. What is the criteria used to include an actor in the ecosystem? How can this actor contribute? If the answer to these questions is not concrete, the participation of this actor should be discarded. Otherwise the ecosystem and the tool would have the purpose of merely promoting a topic, having better tools or methods to achieve that purpose already available.

**Sharing.** Sharing is about transparency of the ecosystem's information. How is the development of the ecosystem goals shared? How transparent is the ecosystem? Depending on the size of the ecosystem several layers may constrain how and who has access to certain information. What are the boundaries of those layers?

**Participation.** Participation is about the behaviour of the stakeholders and managing potential conflicts. What input is required from the actors? Does the ecosystem require an active or passive role of this stakeholder for achieving the goals of the ecosystem? How is the quality of the output judged?

Regarding conflict management, what if an actor requests time and resources from another actor who is not willing to cooperate? Conflicts may arise and the innovation team should be aware. The innovation team is recommended to take an active role in orchestrating the ecosystem, but the responsibility of managing conflicts may reside in the division or Program Manager where the ecosystem lies. I recommend making clear who is responsible before continuing with any implementation task.

**Recognition.** Finally, recognition is about deciding how remuneration and value created are shared among stakeholders. How is the value created as a whole distributed for the individual remuneration of the participants? Who is accountable for the collective success of the ecosystem? Are all stakeholders aware of how success or failure are recognised?

# Tools and Brokers: Implementing the Innovation Ecosystem at KLM Royal Dutch Airlines

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Adrián Esquinas

*MSc Thesis*

Delft University of Technology

June 2022



# IDE Master Graduation

## Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

### ! USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT

Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

### STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief\_familyname\_firstname\_studentnumber\_dd-mm-yyyy". Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !



family name \_\_\_\_\_  
initials \_\_\_\_\_ given name \_\_\_\_\_  
student number \_\_\_\_\_  
street & no. \_\_\_\_\_  
zipcode & city \_\_\_\_\_  
country \_\_\_\_\_  
phone \_\_\_\_\_  
email \_\_\_\_\_

Your master programme (only select the options that apply to you):

IDE master(s): ☐ IPD ☐ Dfl ☐ SPD

2<sup>nd</sup> non-IDE master: \_\_\_\_\_

individual programme: \_\_\_\_\_ - - \_\_\_\_\_ (give date of approval)

honours programme: ☐ \_\_\_\_\_

specialisation / annotation: ☐ \_\_\_\_\_

☐ \_\_\_\_\_

☐ \_\_\_\_\_

### SUPERVISORY TEAM \*\*

Fill in the required data for the supervisory team members. Please check the instructions on the right !

\*\* chair \_\_\_\_\_ dept. / section: \_\_\_\_\_

\*\* mentor \_\_\_\_\_ dept. / section: \_\_\_\_\_

2<sup>nd</sup> mentor \_\_\_\_\_

organisation: \_\_\_\_\_

city: \_\_\_\_\_ country: \_\_\_\_\_

comments  
(optional)

⋮

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..




Second mentor only applies in case the assignment is hosted by an external organisation.



Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

**APPROVAL PROJECT BRIEF**

To be filled in by the chair of the supervisory team.

 chair \_\_\_\_\_ date 2 Feb 2022 signature 
**CHECK STUDY PROGRESS**
 To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair.  
 The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: \_\_\_\_\_ EC

 Of which, taking the conditional requirements  
 into account, can be part of the exam programme \_\_\_\_\_ EC

 List of electives obtained before the third  
 semester without approval of the BoE

☒ YES all 1<sup>st</sup> year master courses passed

☐ NO missing 1<sup>st</sup> year master courses are:

name \_\_\_\_\_ date \_\_\_\_ - \_\_\_\_ - \_\_\_\_ signature \_\_\_\_\_

**FORMAL APPROVAL GRADUATION PROJECT**
 To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked \*\*.  
 Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks?
- Does the composition of the supervisory team comply with the regulations and fit the assignment?

 Content: ☒ APPROVED ☐ NOT APPROVED

 Procedure: ☐ APPROVED ☐ NOT APPROVED

comments

name \_\_\_\_\_ date \_\_\_\_ - \_\_\_\_ - \_\_\_\_ signature \_\_\_\_\_

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

[illegible]

space available for images / figures on next page

introduction (continued): space for images

image / figure 1: \_\_\_\_\_

image / figure 2: \_\_\_\_\_

## PROBLEM DEFINITION \*\*

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

## ASSIGNMENT \*\*

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... . In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

## PLANNING AND APPROACH \*\*

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date      -      -      -      -      end date

## MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... . Stick to no more than five ambitions.

## FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.