

Digitalisation and Future Challenges in Rural Areas: An Open Innovation based Research

Alexander Richter¹, Lukas Waidelich¹, Bernhard Kölmel¹, Rebecca Bulander¹, Patrice Glaser¹,
Matthias Proske² and Sebastian Brüggemann²

¹IoS³ - Institute of Smart Systems and Services, Pforzheim University, Tiefenbronner Str. 65, Pforzheim, Germany

²Planning Association of the Northern Black Forest Region, Westliche Karl-Friedrich Straße 29-31, Pforzheim, Germany

Keywords: Digitalisation in Rural Areas, Future Challenges in Rural Areas, Local Supply, Health Care, Mobility, Work-Life-Balance, Open Innovation, Crowdsourcing.

Abstract: In 2018, the revision of world urbanisation prospects report published by United Nations predicts the global scenario of growing megacities and the accompanying decline in rural populations. This development will profoundly change life especially in rural areas. As a result of research on the central experiences of the practice-oriented “Digital Black Forest” project, this publication addresses the future challenges in rural areas with a focus on local supply, health-related care and residential mobility. The project, promoted by the initiative “digitale Zukunftskommune@bw”, used an open innovation-based research to gather the views of around 500 rural residents in the German Northern Black Forest region. In this context, the project also examines potential approaches to the aforementioned challenges, which are based primarily on new technologies that have been established in the context of the ongoing digital transformation. This paper outlines the scientific exploitation of the results from the “Digital Black Forest” project, aiming to face future challenges in rural areas through approaches to digitalisation.

1 INTRODUCTION

Nowadays, digital transformation is ubiquitous and encompasses all areas of our lives, affecting both our business and social lifestyles. In the business context, new business models can be established as a result of digital disruption, which lead to a transformation of global value chains and push well-established players such as Nokia or Kodak to the edge of their existence (Gassmann et al., 2014). This evolution was initiated and facilitated by new technologies such as the Internet of things, Big Data or artificial intelligence. Furthermore, this transition is increasingly penetrating the private lifestyle, which can be seen in the trend towards smart homes. (McAfee and Brynjolfsson, 2017)

Digitalisation is one of the so-called megatrends. These are significant changes that have shaped our lives for a long time and will continue to shape them for a long time to come. As a consequence of their impact on global society, they usually span several decades and lead to a paradigm shift. Megatrends

have a sustainable impact on the world; the process is slow, but fundamental and lasting. In summary, a megatrend affects every individual and affects all levels of society such as culture, economy, politics, science and particularly technology. (Lux, 2012; Ternès and Schieke, 2018)

Further megatrends besides digitalisation are urbanisation and demographic shift. The United Nations are predicting a further increase in urbanisation, where rural populations are likely to shrink. According to the findings, 68 % of the world's inhabitants will live in urban areas in 2050, compared to a figure in 1950 when only 30 % of the global total lived in urban areas. This contrasts with the challenges facing the rural areas, which are confronted with shrinking numbers. This development is further driven by demographic change, which means that average life expectancy is increasing. (Lux, 2012; United Nations, 2018) Regarding the clearly perceptible effects of the digital transformation, the significance of the further megatrends can only be imagined.

Summarized, the megatrends will have an unpredictable influence on life, as we know it today. For this reason, it is essential to identify the challenges of these megatrends at an early stage and derive the necessary measures from them. In order to address these important issues in advance, the state government of the German federal state of Baden-Württemberg initiated the "digitale Zukunftskommune@bw" initiative in 2018. One of the objectives of the funding was to support communities in preparing themselves for the future with megatrends in mind. This will take place in the form of independently developed, implementable and tailor-made regional digitisation strategies. The Northern Black Forest region applied with the "Digital Black Forest" project for an initial funding to develop a future-oriented digitisation strategy. The project concept envisaged that the local residents of the pilot region will be confronted with digitisation topics on pre-defined issues and will be able to provide input for the successful implementation of digital change on site. Based on these findings, a digital strategy was to be developed and implemented in a follow-up project. This paper describes the approach and presents the results of the public participation on which the digital strategy is based.

2 METHODOLOGY

In order to meet the research challenge both scientifically and systematically, a four-step approach has been established. A systematic literature research was carried out at the very beginning of the "Digital Black Forest" project. In accordance with the responsible stakeholders, priorities were set, and the concepts were reduced to the key areas. The conception, realisation and evaluation of public workshops in four communities in the Northern Black Forest is the third step using the crowdsourcing approach (Brabham, 2013; Brabham, 2008; Estellés-Arolas and González-Ladrón-de-Guevara, 2012; Lemke et al., 2017). Finally, a digital public participation was made possible within the so-called innovation jam, based on the crowdsourcing method.

2.1 Literature Research

In a first step, a systematic literature search on the topic of the transformation of rural areas in the course of the digital transformation was carried out in order to create a basis for the relevant topics. Approaches of Cooper (1988), Brocke et al. (2009) as well as

Webster and Watson (2002) were used to methodically support the first phase.

2.2 Key Topic Identification

Based on the results of the theoretical analysis, in a second step the local stakeholders such as mayors, infrastructure providers and committed regional service providers were included in the final thematic definition. This approach ensured the project team a broad support and acceptance for the realization of workshops in four communities of the nine pilot communities. The selected topics for the workshops were Local Supply, Health Care, Mobility and Work-Life-Balance.

2.3 Workshops

The first approach was four face-to-face workshops, which were actively promoted as "citizen workshops" by the pilot communities. These four workshops were held within two weeks in four of the nine pilot communities. All citizens of the pilot communities were invited to participate by a personal mailing in the form of a flyer. All workshops had the same content and allowed the participating citizens to participate on the desired date. Due to the proximity of the municipalities, the citizens did not have to travel long distances, which was intended to lower the barriers to participation.

The structure of each event was identical and consisted of a greeting by the respective mayor, a presentation by the project leader on the introduction of the project, a motivational presentation on the topics of digitisation and future societal challenges. The final part of the event was the citizens' workshop.

The concept of the workshops had the aim to capture the citizens' perspective on different topics and to document it in a structured way. Based on the "Emphasize" phase of the Design Thinking Process Model (IDEO, 2015; Waidelich et al., 2018), the workshops aimed to capture the citizens' perspective on local supply, health care, mobility and work-life balance. The so-called "jobs-to-be-done" approach was chosen to describe the citizens' view (Christensen et al., 2017; Ulwick and Osterwalder, 2016). This covers the tasks of the citizens in relation to a certain topic area. The "Value Proposition Canvas" approach described by Osterwalder et al. (2014) was used for querying and visually appealing documentation of the citizens' view. The "Customer Profile" was particularly relevant for the "Digital Black Forest" use case. In addition to "customer jobs", this also considers the so-called "pains" and "gains". The

"pains" stand for problems that citizens are currently experiencing with regard to the task (e.g. mobility). Future fears regarding the "pains" were also asked. The "gains" stand for an additional benefit that citizens would wish for, on the one hand, to compensate for the problems or, on the other hand, to receive a more attractive service.

For the actual realization of the workshops, four movable walls were available at each workshop, on which the topics Local Supply, Health Care, Mobility as well as Work-Life-Balance were to be worked on. At each of the walls, a facilitator was present to guide the citizens through the topic area and the related questions. In order to simplify the work, there were also predefined questions on the tasks, problems and the respective additional benefits. The ideas and thoughts of the citizens were written on sticky notes (by them or the facilitator) and attached to the wall. Beside the topic facilitators there was a workshop facilitator, who paid attention to the time and forwarded the previously divided four groups of participants rotating in fifteen-minute intervals for the work on the next topic field. Due to this coordination, each workshop was limited to 60 minutes.

In order to meet a holistic coverage of the citizen opinions there was a fifth topic wall, which offered place for the thoughts, ideas and wishes of the citizens. With the help of this wall, citizens could also address topics that were not covered by the four predefined topic blocks.

At the end of each workshop, the edited screens were photographed and digitally recorded as a basis for the analysis. A total of around 100 citizens took part in each of the four workshops.

2.4 Innovation Jam

In addition to the citizen workshops, the second approach to citizen participation was a so-called Innovation Jam (Hjalmarsson et al., 2017). This format follows the open innovation approach and delivers the results via digital participation in the form of crowdsourcing (Brabham, 2013; Brabham, 2008; Estellés-Arolas and González-Ladrón-de-Guevara, 2012; Lemke et al., 2017). Digital crowdsourcing is used to bring external ideas from citizens into the research process of the project, without the citizens having to be there. They can dial in via an online tool (a modified web conference platform) and participate in the process. In order to minimize the barriers to participation, an explanatory film on participation in the platform was produced and advertised via press release, social media postings and the project website.

The digital crowdsourcing event took place on 14 January 2019 between 3 pm and 7 pm. The four predefined subject areas were also addressed here. Two facilitators led the participants through the event. The workshop was repeated a total of four times in the period described. The special aspect compared to the citizens' workshop was that participants could dial in at any time and participate directly in the discussion. As the workshop was repeated every hour, participants who joined the workshop later were able to get in right in the middle and, after one run, also get out right in the middle of the workshop. By using discussion hints, the participants could see at any time where they were within the workshop and when which topic was being discussed.

A total of more than 100 participants followed the call to participate in the online crowdsourcing event. They took part in the event via computers and mobile devices. The participants made more than 1000 contributions to the topics during the event. From the facilitators' point of view, the discussion was constructive and fair.

2.5 Limitations

As with the majority of research works, the design of the current study is subject to limitations. First of all, it should be mentioned that the focus of this research work is on the results of the open innovation approach. Therefore, this paper focuses on the future challenges in rural areas and the digital solutions derived from them. This paper does not intend to compare the differences of the analogue citizen workshops concept with the digital innovation jam concept. More important, the digital participation format extends the database, which is necessary for the next step, which will be a digital strategy for the region.

3 RESULTS

The results of the four workshops and digital citizen participation are presented in this section. The results are shown in the following order: Tasks, problems, possible solutions.

3.1 Local Supply

With regard to the topic of local supply, the surveyed inhabitants of rural areas identified the tasks in the fields of shopping, infrastructure, social life, access to services, mobility, medical care and the existence of

jobs. In terms of shopping, respondents referred to the purchase of groceries, clothing, bakery and meat products and access to medicines. With regard to infrastructure, inhabitants of rural areas named broadband access and comprehensive mobile communications as essential in addition to the supply of electricity and water. In this context, the availability of day-care centres, schools and education in general was also relevant. Within the topic social life, the workshop participants mentioned the keywords housing, social life and personal contacts, association life and leisure activities as well as cultural events in the region. In addition, access to services such as hairdressing and banking was important to the public. Access to regional jobs was also rated as important.

These aforementioned issues relating to local supply can be categorised under the following topics: economic, services, social affairs, infrastructure, mobility, data security, health care and environment. From an economic point of view, the public is concerned about the decrease in the number of retail stores, empty shops and price competition from online offerings. With regard to services, respondents wish improved opening hours for citizens' offices for employed persons. This category also includes requests for parcel services such as packing stations. In terms of infrastructure, residents complained primarily of inadequate mobile phone coverage. With regard to mobility, the points corresponded to the contents already described earlier. In this case, the general topic of local supply was also addressed in the area of health, where the public considered the unresolved succession of doctors in rural areas and health concerns due to environmental impacts (exhaust gases, radiation, etc.) to be critical. Concerning social factors, fears were expressed about the shift of social life to the Internet, as some are afraid of losing the "digital access". Further concerns were expressed about data security and data protection.

In the field of local supply, the residents were asked for their wishes and suggestions for solutions to the tasks mentioned and the resulting current and future problems. The requests were divided into the categories shopping, mobility, administration, social affairs, energy supply, internet, medicine, local platforms and sustainability aspects. With reference to shopping, the questioned persons wanted especially services, such as the delivery of goods bought online to central points in local areas (e.g. food boxes) or the supply of automated shops, which can offer 24/7 groceries and other goods. Mobile supermarkets or food deliveries by drone were

mentioned in three out of five workshops. Also, the mobility topic was taken up again in the area of local supply. Here the wishes were increased car sharing offers, digital stops for public transport and autonomous buses. With regard to administration and municipal services, there was a great desire for more flexible office hours, digitally manageable administrative services and administrative procedures. It was also suggested that empty local facilities be converted into co-working spaces. All in all, the respondents wanted to increase social services and strengthen the social community. To this end, digital solutions were clearly desired. Concerning the energy supply, which was already mentioned in the task area, the public wanted a development of renewable energies and smart solutions for private users. Another desire was to create intercommunal digital platforms that offers added value to the public. The preferred areas of application were mobility, promotion of the sharing economy and cultural and social issues.

3.2 Health Care

In terms of health care, the tasks related to medical care, non-medical care and the organisation of care for the elderly. In the case of medical care, access to family doctors, specialists, clinical care if necessary, as well as emergency medical services and emergency care were particularly important. For non-medical care, access to the pharmacy and medication was relevant. Physio- and occupational therapy options were also mentioned here. The third major point in the spectrum of tasks of the interviewees was the organisation of care for the elderly, to which mobile care, home care and the organisation and accommodation of relatives in senior living homes were relevant.

Answers given by the public to the problems of health care can be classified into the following categories: access to medical care, access to nonmedical care, time, distance, networking issues, data security, mistrust towards technology and basic issues. People reported problems with getting appointments with the doctor in a timely manner, being admitted or having difficulty gaining access to emergency medical services. The workshop participants consider the accessibility of the pharmacy emergency service (distance) and the supply of prescription medicines to be difficult with regard to non-medical care. For the interviewees, the third topic area is the time factor. The main issue here is that doctors spend very little time per patient and carers have very little time per patient. In addition, the

long waiting time for a doctor's appointment is problematic. These often seem to be difficult to arrange with working hours. In addition, the public opinion is that the waiting times at the doctors are still very long despite an appointment. For many, the distance to medical facilities also seems to be quite large. A further problem mentioned is the lack of networking between doctors, which, according to the public, leads to the same medical tests being carried out several times by different doctors. Some respondents have also stated that the loss of personal relationships, the fear of being evaluated by artificial intelligence or even the fear of the glass insured (against the health insurance company) is accompanied by a personalised health insurance amount. In the field of health care, the public raises questions relating to data security and data protection. Finally, the workshops also addressed basic issues raised by the participants. These included the general fear of the future development of medical care, the costs of additional services/provision, the increasing focus on economic efficiency in health care, two-class medicine, as well as the problem of excluding insured persons from private health insurance in/after a case of disease. The local residents also provided solutions for existing problems in the field of health care. With regard to medical services, the majority of the respondents wanted real-time telemedicine applications for initial consultations, online appointments, or even waiting time optimisation through digital solutions. Moreover, the public considered online platforms for data exchange between doctors to be suitable for combining double medical tests. Some also expressed requests for automated services, such as vaccination or preventive reminders. In addition, regular (e.g. monthly) prescriptions that have to be collected from the doctor seem to be a problem that the public wishes to see via digital data transmission between doctor and pharmacy. Furthermore, local citizens want the local pharmacy to be available online and to offer services and products there. Another wish expressed by older people was that they should be able to use digital medical devices.

In general, respondents believe that the prevention of human error through digitisation can make sense in the medical field.

3.3 Mobility

Regarding the tasks that arise in the context of the mobility, the findings show that mobility is of great importance above all in the professional and private spheres. The third identified area of responsibility are

exceptional situations. In private use, mobility is particularly relevant for family and friends' visits. In some cases, the transfer to sports and leisure activities is also important. Most respondents use individual mobility for holiday travel as well. In each of the presence workshops, the keyword "round trips" was also mentioned, which was described on request as a targeted joyride. Mobility is also relevant for private supplies (groceries, clothing, consumer goods). Another point mentioned in all face-to-face workshops is health care, which was mainly described in the form of visiting a doctor. The reasons given for the use of a private car or the desire for individual mobility were habits, comfort, independence, flexibility and freedom. In the professional context, mobility is relevant first and foremost for going to work. Individual mobility is used for direct access to the work place or for transfer to the nearest central public transport (bus or train) station. For the surveyed residents, access to mobility is also relevant for education and training purposes. Some of the respondents are also dependent on individual mobility for their professional activities, for example to visit customers or transport supplies. The third area of responsibility for mobility mentioned here are exceptional situations. It is important for the respondents to be able to quickly access mobility in an emergency. The interviewees strongly prefer individual mobility.

The problems described can be divided into current problems and future fears. Current problems relate primarily to the areas of private transport, the environment and public transport. From the point of view of the public, individual transport is very developed, which leads to a high traffic density. In particular, commuters complained about traffic jams and the resulting loss of time. People who use or would like to use public transport saw the availability, punctuality, timing and reliability of the services as problematic. The fear of higher costs or a decreasing number of local public transport services were seen as future problems in terms of public transport. Other future fears were driving bans, technological overload, lack of infrastructure and data protection issues. In the discussions, the driving bans related primarily to diesel vehicles used by residents for work-related commuting. The technological overload was increasingly mentioned by older workshop participants who were afraid of being left behind by technological innovations. In parallel to the costs for individual e-mobility, the lack of an e-infrastructure was a concern that prevented people from adapting this technology. The last often discussed issue is the

topic of data protection and data security in relation to mobility.

As a third and final step, the question of public wishes with regard to mobility had been addressed. In general, a generally improved infrastructure was desired. This included road infrastructure, charging infrastructure for e-vehicles and the development of cycle paths. Despite the use of new forms of mobility, a high degree of flexibility was important to the general public. People of all ages highlighted the fact that mobility facilitates social contacts and enables people to participate in social life in this region. Public opinion wanted affordable public transport solutions, new mobility services such as car sharing, or even lower costs by switching to individual e-mobility. In this context, it was pointed out that environmentally friendly mobility is considered positive. Offers for car sharing, ride-sharing or carpooling were expressed as wishes. An intermodal mobility platform, which is intercommunally related, has also been mentioned several times by residents. In addition, local citizens wanted offers with individual buses and taxis (public transport "on demand"), which operate according to individual needs. The individual can then travel autonomously. In three out of five surveys, the air taxi was also mentioned as a possible future sharing service for mobility.

3.4 Work-Life-Balance

The last subject-area surveyed was the question of a work-life balance and the related impacts. The interviewees were working full-time as well as part-time. From fixed working hours to flexitime and shift systems, all working time models were covered in the workshops. With regard to the recording of working time, respondents mentioned models such as the classic recording of working time for fixed working times, but also other approaches such as trust-based working time or annual working time accounts. The topic of home-office/telework also came up at this point. The digital organisation of work in this case takes place via telephone, video conferences or digital organisation tools.

Problems in relation to new forms of work can be divided into current and future feared issues, as well as questions concerning new forms of working time. The workshop participants see current problems in the areas of values of superiors (presence culture), infrastructural problems as well as the traffic on the way to and from work, as well as the lack of broadband and mobile networks being available for the realisation of telework. With regard to the

acceptance of home office solutions, the participants see a need to improve both for employers and employees. In doing so, they ask the question of a meaningful balance of telework solutions. Another concern of the employees was the lack of decoupling of work and leisure time in home office solutions. The employees are afraid that work could increasingly take up their leisure time and that in the long term it would be difficult to "relax". Similarly, the public is assuming that home office cannot replace personal contact. A general concern of respondents is the increasing complexity of activities. Here, too, there is a fear of being left behind.

The persons questioned again provided wishes and solutions for this area. These can be grouped into general, mobility-related and organisational (social and private) categories. In general, the desire for more leisure time and the desire for more flexible working time models on the part of employers exists among the people. In addition, the desire for home office solutions has been expressed several times. Co-Working was presented as a possible solution for the above-mentioned problem that home office does not replace personal contact, since employees from different companies can meet here to work and thus the social interaction and, if necessary, an expansion of the personal perspective takes place. As far as social aspects and private organisation are concerned, the wish for an improved childcare situation was mentioned. The interviewees also said that an active community life or a municipal platform for leisure activities can make a positive contribution to work-life balance. There was also a desire to digitalise administrative services as far as possible and to individualise opening hours ("Opening hours mean stress"). Mobility also has an impact on the work-life balance of the people surveyed. Here they want an enhanced, digitally optimised public transport service. Autonomous driving was also suggested as a solution, as time lost during commuting could be used effectively here.

4 SUMMARY & OUTLOOK

After completion of the assessment, the workshop results were presented to the stakeholders involved. The further procedure was explained and possible implementation projects outlined. The commitment for a further joint approach was also obtained.

The analysis of the workshop results revealed some key and cross-cutting findings and aspects. These were emphasized remarkably often despite the different subject areas. On the one hand, there is a

strong desire for cross-municipal solutions, which can be both digital and analogue. There is also a great concern that services of general interest could be transferred exclusively to the Internet and that social contacts and the local physical infrastructure could be eroded. Another core statement is that people fear that the technical and infrastructural conditions in rural areas may not be sufficient in the future. The fourth core statement is that, despite the fears expressed, the participants have a fundamentally open attitude towards innovations, technological progress and the overriding topic of digitisation. The precondition for this, however, is that digitisation should provide citizens with a clearly discernible benefit in their everyday lives. To achieve this, two implementation projects are initially planned for the regional digital strategy. These will include a joint multifunctional online platform for the Northern Black Forest region and digitised services in local centres in the pilot region. The exact design and realisation of the implementation projects described will be evident from the upcoming digitisation strategy.

On the basis of the results described, the project team will develop a digitisation strategy for the pilot region and will seek further funding for its implementation. This funding from the state of Baden-Württemberg is to be awarded in 2019. It is also important for the stakeholders involved that the "Digital Black Forest" project does not end with the presentation of a digitisation strategy for the pilot region but is continued by the project participants as a long-term initiative in order to involve all citizens in the overall digital transformation.

ACKNOWLEDGEMENTS

We acknowledge the funding initiative "digitale Zukunftskommune@bw" of the Ministry of the Interior, Digitisation and Migration of the German federal state Baden-Württemberg for the support of the project presented here.

REFERENCES

- Brabham, D.C., 2008. Crowdsourcing as a Model for Problem Solving: An Introduction and Cases. *Convergence: The International Journal of Research into New Media Technologies* 14, 75–90.
- Brabham, D.C., 2013. Crowdsourcing. *The MIT Press, Cambridge, Massachusetts, London, England*.
- Brocke, J., Simons, A., Niehaves, B., Niehaves, B., Reimer, K., Plattfaut, R., Cleven, A., 2009. Reconstructing The Giant: On The Importance Of Rigour In Documenting The Literature Search Process. *ECIS 2009 Proceedings*.
- Christensen, C.M., Hall, T., Dillon, K., Duncan, D.S., 2017. Besser als der Zufall: "Jobs to be done" – die Strategie für erfolgreiche Innovation. Plassen Verlag, Kulmbach, 287 pp.
- Cooper, H.M., 1988. Organizing Knowledge Syntheses: A Taxonomy of Literature Reviews. *Knowledge in Society* Spring 1988, 104–126.
- Estellés-Arolas, E., González-Ladrón-de-Guevara, F., 2012. Towards an integrated crowdsourcing definition. *Journal of Information Science* 38, 189–200. 10.1177/0165551512437638.
- Gassmann, O., Frankenberger, K., Csik, M., 2014. The business model navigator: 55 models that will revolutionise your business. Pearson, Harlow, 387 pp.
- Hjalmarsson, A., Juell-Skielse, G., Johannesson, P., 2017. Open Digital Innovation: A Contest Driven Approach. Springer International Publishing, Cham, 140 pp.
- IDEO, 2015. The field guide to human-centered design: Design kit, 1st ed. IDEO, San Francisco, Calif., 189 pp.
- Lemke, C., Brenner, W., Kirchner, K., 2017. Einführung in die Wirtschaftsinformatik: Band 2: Gestalten des digitalen Zeitalters. Springer Gabler, Berlin, 514 pp.
- Lux, W., 2012. Megatrend 2: Demografische Entwicklung, in: *Lux, W.* (Ed.), Innovationen im Handel: Verpassen wir die Megatrends der Zukunft? Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 103–122.
- McAfee, A., Brynjolfsson, E., 2017. Machine, platform, crowd: Harnessing our digital future. W.W. Norton & Company, New York, 402 pp.
- Osterwalder, A., Pigneur, Y., Bernarda, G., Smith, A., 2014. Value proposition design: How to create products and services customers want. Wiley, Hoboken, 323 pp.
- Ternès, A., Schieke, S., 2018. Megatrend Digitalisierung: Wo steht der deutsche Mittelstand aktuell?, in: *Ternès, A., Schieke, S.* (Eds.), Mittelstand 4.0: Wie mittelständische Unternehmen bei der Digitalisierung den Anschluss nicht verpassen. Springer Fachmedien Wiesbaden, Wiesbaden, pp. 5–18.
- Ulwick, A.W., Osterwalder, A., 2016. Jobs to be done: Theory to practice, 201 Seiten.
- United Nations, 2018. World Urbanization Prospects: The 2018 Revision. Key Facts. <https://population.un.org/wup/Publications/Files/WUP2018-KeyFacts.pdf>. Accessed 18 April 2019.
- Waidelich, L., Richter, A., Kölmel, B., Bulander, R., 2018. Design Thinking Process Model Review: A systematic literature review of current Design Thinking models in practice, in: IEEE - Institute of Electrical and Electronics Engineers (Ed.), Proceedings of 2018 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC), pp. 45–53.
- Webster, J., Watson, R.T., 2002. Analyzing the Past to Prepare for the Future: Writing a literature Review. *MIS Quarterly* Vol. 26, xiii–xxiii.