

Society 5.0

Integrating Digital World and Real World to Resolve Challenges in Business and Society



SOCIETY 5.0
Conference

Society 5.0 2021

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First International Conference on Society 5.0
Volume 2

Virtual Forum 22nd to 24th June 2021

Editors: Aurna Gerber & Knut Hinkelmann

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Full papers of the first volume are published in the Springer Communications in Computer and Information Science (CCIS) book series as volume 1477 (<https://link.springer.com/bookseries/7899>).

Papers of the second part are accessible on Zenodo (<https://zenodo.org/>) using the DOI mentioned on the bottom of the first page of each paper.

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The Society 5.0 2021 Proceedings Editors attest as follows: All conference paper submissions that appear in these proceedings have been through a blind peer review process prior to acceptance into the final conference programme.

Editors:

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Preface

This proceedings contain the revised accepted papers of Society 5.0 2021, the *1st International Conference on Society 5.0*¹. A selection of the best papers is published in a volume of Springer CCIS, and the abstracts of these papers are included in this proceedings.

Foreword

It is with great pleasure that we write this foreword to the Proceedings of the first International Conference on Society 5.0 (Society 5.0 2021), to be held as a virtual forum on 22nd-24th June 2021. In 2022 we hope the Society 5.0 conference will take place in Switzerland. We expect this multi- and interdisciplinary conference to grow into a premier conference series.

The annual conference series is jointly organized by the Universidad EAFIT (Colombia), the University of Pretoria (South Africa), University of Camerino (Italy), the Business School of the Shenzhen Technology University (China), the Universiti Malaysia Kelantan (Malaysia), Putra Business School (Malaysia) and the FHNW University of Applied Sciences and Arts Northwestern Switzerland.

Society 5.0 can be defined as a human-centered society that balances economic advancement with the resolution of social problems by a system that highly integrates cyberspace (virtual space) and physical (real) space. The aim of Society 5.0 is to create a society where social challenges are resolved by incorporating the innovations of the fourth industrial revolution (e.g. Internet of Things, Big Data, Artificial intelligence, and the sharing economy) into industry and social life. The term originated in Japan from the government's Council for Science, Technology, and Innovation and it tackles any aspect of society like healthcare, mobility, infrastructure, politics, government, economy and industry.

Society 5.0 also involves the enormous opportunities and challenges of the 21st century. Problems such as climate change, migration and resource consumption must be solved jointly and globally. Sustainable Development Goals (SDGs) such as poverty and education require international efforts. Lessons learned from the Covid-19 pandemic can have an important impact on dealing with global challenges and crisis situations. Technological advancements and trends for digital transformation should assist us to address these global problems. Convergence of cyberspace and physical space can foster new forms of global cooperation. People, things, and systems are all connected in cyberspace. Results obtained by AI can exceed the capabilities of humans and are fed back to physical space.

The Society 5.0 conference series plan to include the entire range of high-quality research about these opportunities and challenges, as well as showcase solutions. The theme for Society 5.0 2021 is *Integrating Digital World and Real World to Resolve Challenges in Business and Society*.

We sincerely thank all our organizers, partners, authors and reviewers without whom this conference would not have been realised.

¹ <https://www.conference-society5.org/>

Technical Information

This Society 5.0 2021 online proceedings are published to support our virtual forum. The proceedings contain two volumes with the revised papers accepted for Society 5.0 2021. We are thankful that our first annual Society 5.0 Conference elicited the support it did during this challenging year with all the uncertainties due to the Covid-19 pandemic.

We received 54 submissions, which were sent out for review to our Society 5.0 programme committee. The programme committee comprised more than 60 members from across the world. Each paper was reviewed by at least three members of the programme committee in a rigorous, blind review process where the following criteria were taken into consideration: Relevance to Society 5.0, Significance, Technical Quality, Scholarship, and Presentation that included quality and clarity of writing.

For this Society 5.0 online proceedings, 15 full research papers were selected for publication in a Springer CCIS volume (which translates to an acceptance rate of 28%). The abstracts of these papers are included in Volume I. A further 21 papers were accepted for inclusion in this online proceedings volume, which amounts to an acceptance rate of 66% of all submissions. These papers are included as Volume II. The papers are listed alphabetically according to the surname of the first author.

Thank you to all the authors and programme committee members, and congratulations to the authors whose work was accepted for publication in this proceedings. We wish our readers a fruitful reading experience with these proceedings!

June 2021

Aurona Gerber and Knut Hinkelmann
Technical Co-chairs: Society 5.0 2021



Organization

The annual conference series is jointly organized by the Universidad EAFIT (Colombia), the University of Pretoria (South Africa), University of Camerino (Italy), the Business School of the Shenzhen Technology University (China), the Universiti Malaysia Kelantan (Malaysia), Putra Business School (Malaysia) and the FHNW University of Applied Sciences and Arts Northwestern Switzerland.



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Part I

Society 5.0 Proceedings
Volume I

The papers in this first part were accepted for Volume I of the Society 5.0 proceedings, which is published in the Springer Communications in Computer and Information Science (CCIS) book series as volume 1477. The abstracts of these papers are included in this proceedings, alphabetically on first author surname.

Blockchain and IoT integration for Society 5.0

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Abstract. The integration of Blockchain and Internet of Things (IoT) will have many implications in the Society 5.0. Blockchain technology has the potential to deal with issues that are related to data ownership, data integrity and data market monopolies. Public blockchains support the implementation of the data democratisation vision where everybody has access to data and there are no gatekeepers that make use of isolated data silos. Smart contracts can be used to provide contract transparency and allow citizens to manage their own data and the deriving economic value. This paper describes a novel blockchain-based security protocol that has been applied to a bicycle rental case study. This has been designed and implemented with the Society 5.0 vision in mind. Users store their own rental data by using a public blockchain. This eliminates the need of a centralised authority, provides data immutability and allows users to agree on transparent smart contract to manage their insurance, their payments and their own rental data. The smart lock protocol has been implemented in a real industrial product that uses the Ethereum public blockchain.

Keywords: Society 5.0 · Blockchain · Internet of Things · Smart Lock · Smart Contracts.

Modelling Transformation of Corporate Communications in the Digital Age

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Abstract. This article provides a brief overview on transformative trends in corporate communications based on a literature review. Furthermore, it presents a framework model on how to transform corporate communications in the digital age. The model is based on a grounded theory approach derived in a field study completed in 2015, which claims that more heterarchical structures in corporate communications are needed. In a subsequent project, the model is tested in an ongoing exploratory study. Based on the learnings from the two studies, we suggest a new model on how to organize corporate communications in the digital age. At the centre of the new model are written and audio-visual content, created by associates in a collaborative process and supported by the organisation.

Keywords. corporate communications, digital transformation, heterarchical structures, exploratory study, field study

Implementing Robotic Process Automation for Auditing and Fraud Control

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Abstract. The cost of fraud continues to be a problem for many organizations in the global economy. This study explores how robotic process automation may offer a way forward for organizations to reduce fraud and advance organizational audit effectiveness for detecting potential fraud areas and cases.

The research was performed by conducting a literature review that considered 22 articles (through a selection process) on the relevant research themes of robotic process automation, fraud and auditing.

The findings suggest that organizations should consider robotic process automation as a means for reducing fraud opportunities in organizations. Robotic process automation may also assist organizations to advance their audit efficiency and effectiveness.

The paper conclude by proposing a theoretical framework for the implementation of robotic process automation in fraud control and auditing. A number of new theoretical questions arose during this analysis. This include, the potential use of robotic process automation by fraudsters in support of organizational fraud and secondly, the new skills required by auditors to be effective in an intelligent workplace.

Keywords: Robotic Process Automation, Fraud, Audit, Systematic Literature Review.

Design parameters of multidimensional reward systems based on preference analysis of Students of Business Information Systems (Bachelor and Master) at the University of Applied Sciences Northwestern Switzerland

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Abstract. In Switzerland, there is currently a major shortage of skilled workers in many companies and organisations. A particular bottleneck can be seen in the area of IT professions. The lack of qualified employees is a challenge for future education and training and intensifies the current competition for today's necessary and urgently sought talent in the IT sector. In this context, it will be crucial in the future how attractive and individualized compensation systems can be designed for potential employees. Needs-based compensation packages should help to attract and ultimately retain future IT professionals. The aim of this study is to measure the preferences of students of business informatics at the FHNW to analyse which elements of total rewards management are crucial for the choice of a future employer. The results will help companies optimise the total rewards system according to their needs or include those factors that can be expected to provide the best benefits for future employees. Thus, not only the total monetary value, but also the composition of financial and non-financial elements must be included in this overall consideration.

The aim is to provide decision-makers in organisations with targeted information that will allow them to design optimal incentive packages to be an attractive employer for students of business informatics or potential employees in the informatics field.

Keywords: Web-Tool Reward Design, Discrete Choice Analysis, Data driven Business Analytics, Flexible Wage Systems, Employer Attractiveness.

Role of Innovation Competitive Advantage on Strategic Orientation Dimensions and Sustainable Growth of SMEs in Nigeria

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Society 5.0 Conference. *University of Applied Sciences and Arts, Northwestern Switzerland School of Business, Virtual forum - 22nd to 24th June 2021.*

Abstract

The purpose of this study was to examine the role of innovation competitive advantage on strategic orientation dimensions of (entrepreneurial orientation, market orientation, and resource orientation) on the sustainable growth of SMEs. This study used a total of 217 responses adopting the cross-sectional survey research design from manufacturing SMEs owners/founders. The results were analysed using PLS-SEM via SmartPLS version 3.3.3. The major findings established that entrepreneurial orientation did not directly link with the sustainable growth of SMEs. The study confirmed that market orientation and resource orientation revealed a direct and significant positive link with the sustainable growth of SMEs. Similarly, innovation competitive advantage has a direct significant positive association with the sustainable growth of SMEs. Likewise, entrepreneurial orientation and market orientation have a direct and significant positive relationship with innovation competitive advantage. However, resource orientation did not significantly relate to innovation competitive advantage. The findings validated that innovation competitive advantage mediated the relationship between entrepreneurial orientation, market orientation, and the sustainable growth of SMEs. Finally, innovation competitive advantage did not mediate between resource orientation and sustainable growth of SMEs, which have not previously been proven in empirical studies. This study was designed to address the existing gaps and provide reasons to prove them. This study is indeed one of the remarkable studies in the context of SMEs, which integrates these selected variables into a single model. The originality focused on the role of innovation competitive advantage on strategic orientation dimensions and sustainable growth of SMEs that are relevant to Society 5.0.

Keywords: Entrepreneurial orientation, Market orientation, Resource orientation, Innovation competitive advantage, sustainable growth of SMEs.

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A Knowledge Base about Non-Pharmaceutical Interventions to Support Hospitals in Responding to Pandemic Situations

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Abstract. The ability to properly respond to a biological disaster such as the Covid-19 pandemic is fostered by making knowledge available quickly and consistently. In absence of a vaccine, knowledge about appropriate actions that prevent the spread of the virus (i.e., non-pharmaceutical interventions - NPIs) becomes essential to save lives. This is especially the case in hospitals, as everyone, including healthcare personnel, is exposed to a high risk of infection. Within this context, decision makers about NPIs in hospitals are constantly under pressure. They have to quickly interpret numerous, lengthy and ever-changing regulatory documents, coming from multiple public authorities for the creation of internal security protocols against the spread of the virus. This is a knowledge intensive task calling for support to ensure an efficient response to a pandemic situation. In this paper, a knowledge base is presented, which consists of an ontology, semantic rules and queries about NPIs. The knowledge base was systematically engineered by considering both (a) official regulatory documents of multiple public authorities and (b) expert knowledge from a Swiss hospital. The ultimate goal of this work is to support decision makers in the creation of consistent security protocols about NPIs. The approach is evaluated via the implemented knowledge base which proves that questions relevant for a decision maker are automatically answered.

Keywords: Emergency Management, Response, Knowledge Base, Decision Making, Non-Pharmaceutical Interventions, Biological Disaster, Covid-19 Pandemic.

COVID-19 Contact Tracing Apps

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Abstract. As a response to the COVID-19 pandemic, many countries, including Switzerland, have put enormous efforts to break chains of infections using automated contact tracing apps for smartphones. As a result, different approaches such as centralized and decentralized apps with a wide range of frameworks have been deployed, including DP-3T and PEPP-PT. It immediately raised privacy concerns and intensified the importance of ensuring interoperability between the various apps, especially in border regions. Those frameworks were examined regarding its privacy architecture and interoperability, including usage of the tracing apps of Switzerland, France, and Germany. Applicable regulations such as the GDPR must be complied with, and user concerns and the general effectiveness of automated tracing applications respected. Finally, the conclusion answers the main objectives and provides an outlook with potential solutions.

Keywords: COVID-19, tracing apps, interoperability, regulations, Switzerland

Moving Towards Society 5.0: A Bibliometric and Visualization Analysis

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Abstract. This paper aims to provide a holistic approach for a brief understanding of the current state of literature of Society 5.0 by deciphering its characteristics, subjects, the geographical distribution of publications, keywords and general concepts by using bibliometric data retrieved from the Scopus database. We used descriptive analysis to examine publication characteristics, subjects and geographical distribution of published documents, Harzing's Publish or Perish to calculate citation metric and VOSviewer version 1.6.16 for data and network visualization. Through the network analyses of author and index keyword co-occurrences, research clusters were revealed from different perspectives. The bibliometric analysis indicates that Society 5.0 is heavily influenced by the advancement of the Industrial Revolution (IR) 4.0. The intellectual structure of the Society 5.0 literature is being dominated by engineering-related fields, artificial intelligence (AI), and the Internet of Things (IoT). Our analysis revealed the existence of a strong link in the temporal co-map between Sustainable Development Goals (SDGs) and Society 5.0. This paper also emphasizes on university's role as an important stakeholder in Society 5.0 ecosystem.

Keywords: Bibliometric study, SCOPUS, Society 5.0, emerging research topics

Determinants of the Adoption of Virtual Team Collaboration as a Mode of Knowledge Transfer within Innovation Driven Organisations

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Abstract. Society 5.0 seeks to resolve social and economic imbalances through the integration of the virtual world and the physical world. Amid the COVID-19 pandemic the need and possibilities hereof has become so much clearer. This paper aims to shed light on the factors affecting the adoption of virtual team collaboration within innovation driven companies, as their primary mode of knowledge transfer. By getting insight into these factors, we will be on our way to enable individuals, companies and governments to promote effective adoption of virtual team collaboration. This in turn can reduce the knowledge gap that exists in developing post-colonial countries, by enabling knowledge to be better transferred between industries within the country and from outside the country. This paper provides an in-depth coverage of the existing literature starting by looking into knowledge transfer as a management principle, then looking at the innovation of virtual team collaboration itself and finally at the social system, an innovation driven organisation, into which the innovation will be adopted. The findings are then applied to the Diffusion of Innovation theory's Innovation-Decision Process. By understanding these key determinants, organisations may utilise this guidance in the application of virtual team collaboration (VTC) as a mode of knowledge transfer when considering innovation.

Keywords: Society 5.0, Virtual Team Collaboration, Innovation Driven Organisation, Knowledge Transfer, Knowledge Management, Diffusion Of Innovation, Innovation-Decision Process.

An Indoor Farming Framework for decision support towards food security in Society 5.0

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Abstract. One of the key aspects outlined in the Sustainable Development Goals (SDGs), is food security. The discourse around food security recognizes that resources such as water and land are finite, and the agenda to end hunger remains a major challenge. Furthermore, the objective of Society 5.0, to integrate digital technologies and a human-centered society to foster economic advancement and the resolution of social problems, augmented the reasons to address food security. Therefore, the purpose of this paper is to consider indoor farming as an agricultural technology capable of producing more food using fewer resources, as opposed to traditional farming, that is enabled through targeted capital investments. We developed an Integrated Farming Framework (IFF) with the aim to provide decision support to guide potential investors in indoor farming. Ten key aspects were identified and mapped to the Technology-Organization-Environment (TOE) framework, identifying a fourth construct, societal context. These constructs include the basic elements required for investors to consider financing in indoor farming projects. By applying the IFF, investors will be able to consider their investment options holistically.

Keywords: Society 5.0, Sustainable Development Goals, Food security, Human-centered society, Indoor farming, Investment, Decision Support.

Does Board Composition Taking Account of Sustainability Expertise Influence ESG Ratings? An Exploratory Study of European Banks

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Abstract. In the context of the European Green Deal, the European Commission opened a consultation on the realignment of corporate governance with key aspects of a sustainable economy in late 2020. Based on the understanding that board composition is considered a key factor to promote sustainable business management (EU Commission & EY, 2020), the European Commission is considering enforcing legislative measures regarding sustainability expertise on boards. Why sustainability expertise on boards drives sustainability forward is substantiated by different theories, such as the resource dependency theory, human capital theory, agency theory and social psychological theory (Carter et al., 2010). Academic literature in the area of ESG performance in relation to board characteristics most widely uses the variables (gender) diversity, the share of independent directors, board size and the existence of a sustainability committee (Birindelli et al., 2018). The impact of sustainability expertise on ESG performance has not been studied so far. This study examines if the number of board directors with sustainability expertise and sustainability leadership have a positive effect on the ESG ratings of EURO STOXX Banks 30. Results indicate that sustainability expertise on boards and sustainability leadership with major European banks is still rather low. Encouraging results could be found supporting the hypotheses.

Keywords: Sustainability, Board Composition, Banks.

The Smart City: Analysis of Application Areas and their Potential in an International Context

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Abstract. With the continuous growth of the world's population, increased pollution levels, global warming, resource scarcity, lack of physical and social infrastructure, hyper-urbanization as well as changes driven by the fast-advancing technology sector, there is a need for fresh input to the strategic development of cities. In the battle for cost-effectiveness and ensuring environmental stability, it is of utmost importance that cities alter their strategies and approaches to achieve higher efficiency in all domains. This study includes the identification of a smart city's application areas and will investigate whether they work in practice in a cross-country comparison of smart cities. A best practice framework that includes successful smart city application areas and their potential including a holistic strategy is provided based on a solid literature foundation and validated by empirical research. The findings of this research suggest that a holistic strategic approach of a smart city's application areas contributes to achieving its maximum potential through a government that not only makes data publicly available, but also sets the right framework for modern business models, and thinks comprehensively to deploy resources where they are most needed.

Keywords: Smart city definition, Urbanization, Smart city application areas, Smart city best practice framework.

Adopting AI in the Banking Sector – The Wealth Management Perspective

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Abstract. While interest in understanding the impact of Artificial Intelligence (AI) in the real world has been growing, there is limited research on what digital transformation means in the banking sector. The present paper aims to address this gap in the literature by means of a field study based on 11 interviews with wealth managers from across front, middle and back offices in a large Swiss bank. Our analyses suggest bank employees have relatively positive attitudes toward the adoption of new technologies. According to the research, the top three advantages for adopting AI in wealth management are: efficiency, enhanced clients' experience and better customer insight. Yet, AI also brings new challenges to banking. Obstacles identified include process complexity, greater maintenance effort, and increased regulatory requirements. Still, AI is expected to change the banking model to an integrated, hybrid and leaner operation with digital processes that offer front-to-back solutions. With respect to the future of the bank workforce, hiring tech-savvy talent will be crucial. AI will be able to free bank employees from repetitive jobs for more interesting and creative tasks.

Keywords: Artificial Intelligence (AI), Banking sector, Wealth management.

Collaborative Model-Based Process Assessment for trustworthy AI in Robotic Platforms

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Abstract. The use of robots in combination with artificial intelligence (AI) is a trend with the promises to relieve humans from difficult-, time consuming- or dangerous work. Intelligent robots aim to solve tasks more efficiently, safer or partly more stable. Independent of the domain-specific challenge, the configuration of both (a) the robot and (b) the AI currently requires expert knowledge in robot implementation, security and safety regulations, legal and ethical assessments and expertise in AI. In order to enable a co-creation of domain-specific solutions for robots with AI, we performed a laboratory survey – consisting of stakeholder interaction, literature research, proof-of-concept experiments using OMiLAB and prototypes using a Robot Laboratory – to elicit requirements for an assistant system that (i) simplifies and abstracts robot interaction, (ii) enables the co-creative assessment and approval of the robot configuration using AI, and (iii) ensures a reliable execution. A model-based approach has been elaborated in the national funded project complAI that demonstrates the key components of such an assistance system. The main concepts paving the way for a shift from research and innovation into real-world applications are discussed as an outlook.

Keywords: Robotic, Artificial Intelligence, Model-based Approaches.

Examining Future Ready Accounting Course (FRAC) Experiences for Non-Accounting Students: An Education in Society 5.0 using Augmented Reality and IoT

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Abstract. An accounting course today has become an essential syllabus for social sciences students, particularly, in business, management, and entrepreneurship. Since social sciences students are not purely accounting students, learning accounting is proven to be more challenging for them and innovations for the course, including the methods used in teaching the accounting course. This study aims to develop a Future Ready Accounting Course (FRAC) for non-accounting students by using simple augmented reality technology, embedded into the course's teaching and learning method. This study examines the non-accounting students' experiences of applying FRAC in their accounting courses. By using a mixed method approach, questionnaire surveys were conducted to examine the students' experiences towards FRAC revolving three elements of the course, lecturers, and infrastructures or facilities. Since the lecturer teaching FRAC composed one member of the research team, a field observation also carried out to monitor the FRAC's implementation. The results of the study reveal an evidence that an accounting course can indeed be taught in more innovative and attractive ways. In other words, accounting departments would do well to consider the novel contribution made by this study by adopting FRAC to replace the old-fashioned conventional accounting courses. It is noted that the non-accounting students employed in this study were able to feel a new experience in learning an accounting course with the adoption of FRAC. This significantly concludes that FRAC can successfully attract and help non-accounting students to excel in their accounting courses to fulfil the requirements of their degrees.

Keywords: Education for Society 5.0, Future Ready Accounting Curriculum, Augmented Reality, Internet of Things.

Part II

Society 5.0 Proceedings
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Building a Taxonomy of Industry 4.0 Needs and Enabling Technologies.

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Abstract. A thorough understanding of the concept of Industry 4.0 is needed to assess the overall plethora of I4.0 enabling technologies and define their application domains and uses. The objective of the research paper is to review Industry 4.0's main application fields and examine which enabling technologies are used in use cases in the industrial environment, as well as developing two taxonomies: one for enabling technologies in the Industry 4.0 world and the other for classifying I4.0 problems. This taxonomy can be used for both product innovation and product optimization in industrial companies' strategic planning. This goal was met by analyzing the state-of-the-art in Industry 4.0 based on recent scientific developments and real-world use cases in industrial enterprises.

Keywords: Industry 4.0 applications · Edge Computing · Artificial Intelligence · Machine Learning · Internet of Things.

1 Introduction

The fourth Industrial Revolution, also known as I4.0, is now in full swing. The word "Industry 4.0" was coined in Germany when the government and private sector, led by Bosch, formed a research group to make German manufacturing more competitive in the global market [1]. This term encompasses all manufacturing domains and includes advanced manufacturing technologies that collect, optimize, and deploy data. The idea of German government behind Industry 4.0 is to exploit the potentials of new technologies and concepts such as :

- availability and use of the internet and IoT
- integration of technical processes and business processes in the companies
- digital mapping and virtualization of the real world
- 'Smart' factory including 'smart' means of industrial production and 'smart' products

Smart factories are equipped with sensors, embedded software, and robotics solutions that collect and analyze data for better decision-making. Analysis of large amounts of data can provide tools that perform predictive maintenance, self-optimization of the process, and meet customers needs more cost-effectively which was not possible before.

Industry 4.0 technologies assist businesses in managing production planning and scheduling, capacity usage, maintenance, and energy conservation, as well as allowing for customized solutions, flexibility, and cost savings in manufacturing processes.

A question that many experts ask nowadays is **what are the typical problems that can be addressed by Industry 4.0?** Industry 4.0 allows comprehensive real-time tracking of operations, allowing for real-time data collection, monitoring, and maintenance; it implements a new and significantly enhanced system of development, service provision, mode of supply, storage, distribution and a significant enhancement of business support activities. One of the challenges faced by Industry 4.0 is managing the large amounts of data produced by analyzing output data and integrating the results with customer information systems.

Big data analysis may help managers detect defects, faults, and flaws in the manufacturing process at an early stage, optimize automation processes and conduct trend studies, use resources more effectively, and perform predictive maintenance. Predictive maintenance identifies equipment failure before it happens, allowing you to continually improve the production process and increase manufacturing performance.

Given this wide range of potential enhancements enabled by 4.0 applications another question arises: **What are the 4.0 key enabling technologies?**

In the Industry 4.0 environment, the European Commission identifies nine main enabling technology developments (Figure 1.) and investigates their possible technological and economic benefits for manufacturers and production equipment suppliers [2]. We used the enabling technologies provided from European Commission as guidelines for our research, for categorize the technologies.

These enabling technologies are Advanced Manufacturing Solutions , Additive Manufacturing, Augmented Reality, Simulation, Horizontal/Vertical Integration, Industrial Internet, Cloud, Cyber-security, Big Data, and Analytics; their existence helps in turning manufacturing into a completely digitized and intelligent operation.

Furthermore, according to the Microsoft study [3], crucial technology drivers for IoT success in the coming years are AI, Edge Computing, and 5G. Companies should be aware of these enabling technologies' capabilities and they need a detailed technology roadmap and guide lines for incorporating enabling technologies into their strategies and businesses. There are still many companies that doesn't know the potentiality, benefits and how of use Industry 4.0 and AI technologies for improving the productivity and quality of the company.

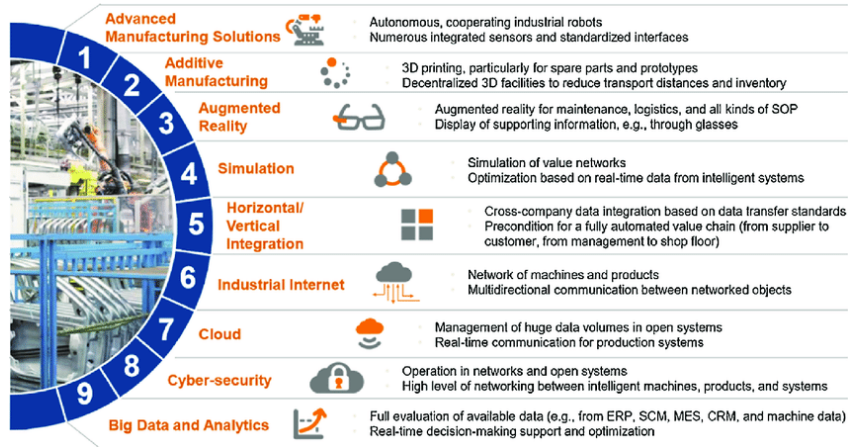


Fig. 1. Key nine enabling technology trends.

AI technologies are methods and procedures that allow technical systems to interpret their environments, solve problems independently, find new ways to solve challenges, make decisions, and, most importantly, learn from experience to become more proficient at completing tasks and actions, according to the industry.

The AIoT paradigm [4], the combination of AI with IoT has become popular during recent years. It's a groundbreaking computing approach that can contribute to the creation of more scalable, effective, and secure I4.0 solutions.

For help the companies to use enabling technologies and improve the productivity and quality, we tried to answer the following questions: 1) **Which of these Industry 4.0 addressable issues and which of these Industry 4.0 key enabling technologies have been implemented and used in industrial use cases?** 2) **Is it possible to create a taxonomy that categorizes I4.0 problems and supporting technologies?** 3) **What is the relationship between I4.0 issues and enabling technologies?**

2 4.0 Taxonomies Building

There is a need to look beyond scientific articles to find answers to these questions. As a result, we conducted desk research using academic papers as well as white papers, business use cases, and consulting company reports as sources. Two taxonomies were developed, one based on enabling technologies in the Industry 4.0 environment, and the other for classify I4.0 problems. The two taxonomies are connected by the use cases founded on white and academic paper. Each use case was regarded as representative of one or more Industry 4.0 issues, from which we extracted the I4.0 enabling technologies that were used to solve the issues.

2.1 4.0 innovation problems

First of all, we can divide the I4.0 innovation problems into 2 main categories: Product innovation, Process optimization .

- **Product Innovation** - aims at building a new generation of products that are typically IoT connected thus migrating the business toward a service-based solution. Product Innovation in the 4.0 era also aims at improving the usability of products by making them easier to use and understand.
- **Process Optimization** - aims at improving the efficiency of production processes to reduce the product and goods production costs. Industrial processes can be optimized by improving the efficiency of equipment, workforce and supply-chain. It consists of changes of production processes of the product/service, and may not necessarily have explicit impact on the final output, while increasing the productivity and reducing producing costs .

From Product Innovation we can derive other sub-problems of I4.0 as:

- **Product Servitization** the innovation of organization's capabilities and processes to better create mutual value through a shift from selling product to selling Product-Service Systems
- **Usability Improvement** product usability improvement by designing user interface, with usability testing, targeting customer.
- **After-Sales support** any service provided after a customer has purchased a product
- **Automatic consumables reorder** measuring consumable usage to reliably determine when to increase or decrease the production
- **Inventory Management** is a systematic approach to sourcing, storing, and selling inventory, both raw materials (components) and finished goods (products).
- **Cost and Number of parts Reduction** is the achievement of real and permanent reduction in unit cost of products manufactured
- **Smart products (self-diagnosing products)**

From Process Optimization we can derive more sub-problems of innovation on I4.0 as :

- **Equipment efficiency improvement**
 - **Real-time Production monitoring and Supervision** : Constant stream of data about the overall health and performance of assets and production lines. Real-time alerts can help operators quickly address any issues before they become major failures that can cost plant valuable time and money. With the right information at their fingertips, operators can make faster, more data-driven decisions to ensure your optimal performance
 - **Predictive maintenance** : Detects the early signs of equipment malfunctions, allowing store managers to prepare spare machinery and avoid downtime. The IoT enables reducing downtimes and machine repair expenses, facilitating warehouse management considerably

- **Smart Scheduling** : The adoption of Smart Scheduling will allow industries to profit from the cumulative experience in their fields (for instance, facilitating the selection of appropriate rescheduling strategies). In turn, the adoption of tolerance scheduling allows making intuitive and natural decisions, seen from the point of view of the requirements of manufacturing industries, overcoming the resistance to the implementation of Smart Manufacturing and Industry 4.0 environments, usual among personnel in traditional firms
- **Vertical interconnection and integration (between departments in a factory)** The integration of IT systems at various hierarchical production and manufacturing levels, rather than horizontal levels, into one comprehensive solution
- **Worker security improvement and accident prevention**
 - **Smart PPE (personal protection equipment)** PPE, such as safety shoes, ear plugs and protective eyewear, has always been important in protecting the wearer from one or many occupational safety and health (OSH) risks. If an activity carried out by a person — the wearer of the PPE — involves a certain risk that cannot be further reduced by other (collective technical or organizational) means, the use of PPE is essential to enable that person to do their job without or with less risk of injury. PPE must function reliably and provide a high level of protection. This principle of the hierarchy of prevention has been successfully used for a long time.
 - **Worker attention and mental state monitoring** Improving working conditions based on real-time temperature, humidity and other data in the plant or warehouse, quick detection and enhanced protection in case of incidents, detection of presence of gasses, radiation and so forth, better communication and collaboration possibilities, a focus on ergonomics, clean air and clean factory initiatives (certainly in Industry 4.0 as the EU wants to be leading in clean air and clean anything technologies)
- **Worker routine and operation optimization**
 - **Time and Method smart measurement** Scheduling is the process of arranging and controlling workloads via shift work scheduling and data analytic.
- **Supply Chain**
 - **Horizontal interconnection and integration (between different actors of the supply chain)** Horizontal integration in Industry 4.0: from supplier to consumer, end-to-end integration of IT systems and information flows with IoT, analytics and data
 - **Production on demand enabling technology**
 - **Smart warehouse** IoT solutions for warehouse management provide real-time data on product locations, transportation conditions, the integrity of packaging, and so on. Thanks to instant updates, store managers can ensure no inventory is lost during transportation and ensure that supply chain vendors are managing deliveries responsibly

- **Supply chain transparency and reliability improvement** Achieving supply chain transparency is the fundamental process of increasing visibility, traceability and transparency by collecting and sharing information throughout the supply chain and communicating it to authorised internal and external stakeholders. The purpose of improving the reliability of supply chains is to meet the needs of consumers as quickly and qualitatively as possible

2.2 4.0 needs and enabling technology identification

Table 1 shows a list of sources that can be used to build a taxonomy of both problems and enabling technologies. The white paper, research paper, and business use cases were all considered sources for the development of two taxonomies, as shown in the table.

Table 1: List of articles for development of a Taxonomy.

Article Name	Article Type	Publication Date
AI in production [5]	white paper	7 Mar. 2019
Optimization of machining process [6]	academic paper	2 Mar. 2019
AI for defect detection [7]	business use case	30 Mar. 2020
Predicting Defects in Manufacturing [8]	academic paper	Oct. 1999
IoT Impacts the Supply Chain [9]	white paper	22 Oct. 2019
Smart Scheduling [10]	academic paper	Aug. 2018
Process Discovery: Capturing the Invisible [11]	academic paper	Mar. 2010
Designing a novel shuttle with picking system [12]	academic paper	2019
Condition monitoring in I4.0 [13]	academic paper	2019
Industry 4.0 in the tobacco industry [14]	academic paper	Feb. 2020
Logistic Industry Innovations with IoT [15]	white paper	17 Sept. 2019
ML in Demand Forecasting [16]	business use case	20 June 2020
Edge - Computing [17]	business use case	25 Aug. 2020
Predictive Maintenance using ML [18]	business use case	
5G Heart of Industry 4.0 [19]	white paper	
Real-Time Production Performance Monitoring [20]	business use case	
Smart Warehouse System [21]	business use case	
Blockchain-enabled IoT shipment tracking system [22]	business use case	

Continued on next page

Table 0able – continued from previous page

Article Name	Article Type	Publication Date
Vehicle Tracking and Fleet Management [23]	business use case	August 2015
Smart Tracking Solution [24]	white paper	
Reducing Complexity with Simplicity [25]	academic paper	
IoT Order Fulfillment [26]	white paper	
Asset Tracking [27]	business use case	
Predictive Maintenance [28]	business use case	
Predictive Analytics Using Rattle and Qlik Sense [29]	business use case	
Supply Chain Management [30]	white paper	
IoT in Retail [31]	business use case	
Remote Measurements Control[32]	business use case	
IT plus OT convergency for your automation solution [33]	white paper	
Data driven technology for efficiency in energy intensive industries [34]	white paper	
Improving stores efficiency using clients shopping times [35]	white paper	
Smart PPE and IoT to improve workplace safety [36]	white paper	
Cost Management For After-Sales Supply Chain [37]	white paper	May 2012
IoT Retail with Consumer Smartphone detection [38]	business use case	
IoT Industry Solution [39]	white paper	
Tracking System [40]	white paper	
Product Service System for aerospace maintenance [41]	academic paper	
Artificial intelligence at the edge [42]	white paper	
Energy sources optimization [43]	white paper	
Predictive maintenance and production optimization[44]	white paper	Sep. 2020
Leveraging IoT Framework [45]	academic paper	

2.3 4.0 enabling technologies

The focus of the research was done on Advanced Manufacturing Solutions, Horizontal/Vertical Integration, Industrial Internet, Cloud, Big data and Analytics out of key nine enabling technology trends from the European Commission, that was mentioned in the Introduction section since based on the found sources these

five enabling technologies are said to play a crucial role in the solution of Industry 4.0 problems. Table 2 lists all the technologies investigated in the literature which are considered as enabling technologies of Industry 4.0. The taxonomy was derived using as main categories the same categories identified by the European Commission. Many of the key nine enabling technologies that form the basis for Industry 4.0 are already in use in manufacturing, but when combined with Industry 4.0, they will transform production: isolated, optimized cells will come together as a fully integrated, automated, and optimized production flow, leading to a shift in traditional production relationships among suppliers, manufacturers, and customers—as well as between human and machine. The following is a list of enabling technologies that were considered when creating a taxonomy of enabling technologies [46]:

- **Big Data and Analytics** - the collection and comprehensive evaluation of data from various sources production equipment and systems will become standard to support real-time decision making.
- **Industrial Internet** - devices will be enriched with embedded computing and connected using standard technologies.
- **Cloud** - machine data and functionality will increasingly be deployed to the cloud, enabling more data-driven services for production systems.
- **Horizontal/Vertical Integration** - functions from the enterprise to the shop floor level are not fully integrated. With Industry 4.0, companies and departments will become more cohesive, universal data-integration networks will evolve.
- **Advanced Manufacturing Solutions** - the greater connectivity and interaction of Industry 4.0-capable machines and systems in their factories, manufacturing-system suppliers will have to expand the role of IT in their products.

3 Discussion

We have created the taxonomy to investigate the most important issues and most used technologies in the field of Industry 4.0 . The taxonomy can be used also as guidelines for resolve Industry 4.0 problems

The generated taxonomy can be used as a search engine at the following link: https://docs.google.com/spreadsheets/d/1JyHiKv_kBnENTA8yGMV3Sn9x05hKOLJwf49LwdYiEU0/edit?usp=sharing.

Unfortunately, we were unable to identify a use case for every problem that exists in the industry 4.0 world; however, it is worth pointing out that, among the papers reviewed, Real-time Production Monitoring Analysis, Predictive Maintenance, Smart Scheduling, Smart Warehouse, Cost, and several parts/component reduction are said to be the most frequently addressed problems in the Industry 4.0 world. According to the considered business use cases, white papers, and research articles, the most commonly used enabling technologies are Time-series

Table 2. List of I4.0 enabling technologies.

Horizontal/Vertical Integration	Industrial Internet
<ol style="list-style-type: none"> 1. DataBases <ol style="list-style-type: none"> (a) SQL DB (b) Non SQL DB (c) Time series DB <ol style="list-style-type: none"> i. InfluxDB ii. Prometheus iii. Graphite 2. Blockchain 3. Connectivity <ol style="list-style-type: none"> (a) GSM/4G/5G (b) MQTT, Node-Red (c) REST API and Webhook (d) RFID/NFC (e) Bluetooth (f) LPWAN 	<ol style="list-style-type: none"> 1. Industrial IOT <ol style="list-style-type: none"> (a) Industrial communication protocols <ol style="list-style-type: none"> i. Ethernet Protocols ii. Fieldbus Protocols iii. Wireless Protocols (b) Industrial Gateway and data acquisition device
Big Data and Analytics	Cloud
<ol style="list-style-type: none"> 1. Data science <ol style="list-style-type: none"> (a) Data Visualization and Dashboarding <ol style="list-style-type: none"> i. Grafana ii. Kibana iii. Metabase (b) Data Analytics <ol style="list-style-type: none"> i. Data lake and Data Warehouse design ii. Data Mining <ol style="list-style-type: none"> A. Python B. R C. Julia iii. All-inclusive tools <ol style="list-style-type: none"> A. Tableau B. PowerBI C. Elastic Stack D. SAP Business Intelligence E. QlikView/Qlik Sense iv. Data Engines <ol style="list-style-type: none"> A. Apache Hadoop B. Apache Kafka C. Apache Spark 2. IoT <ol style="list-style-type: none"> (a) Signal Processing 3. AI <ol style="list-style-type: none"> (a) Machine Learning (b) Deep Learning (c) Reinforcement Learning (d) Continuous Learning (e) Computer Vision (f) Natural Language Processing 	<ol style="list-style-type: none"> 1. Container Technology <ol style="list-style-type: none"> (a) Docker (b) Kubernetes (c) Terraform 2. Serverless programming <ol style="list-style-type: none"> (a) AWS Lambda functions (b) Azure functions 3. Device Management <ol style="list-style-type: none"> (a) Zerynth Device Manager (b) AWS IoT Device Management (c) Azure IoT Hub (d) WinCC OA IOT OPA 4. Cloud Data Storage <ol style="list-style-type: none"> (a) AWS S3 (b) Google Cloud Storage (c) Microsoft Azure Storage 5. Edge Computing <ol style="list-style-type: none"> (a) AWS green grass (b) Azure Edge IoT (c) Custom solutions based on docker swarm (d) Multi-access edge computing (MEC) (e) AWS Wavelength
Advanced Manufacturing Solutions	
<ol style="list-style-type: none"> 1. Embedded Computing <ol style="list-style-type: none"> (a) Arduino (b) STM32 (c) ESP32 (d) FRGA 2. Sensors (hardware) 3. Signal Processing 4. Blockchain 	<ol style="list-style-type: none"> 5. Connectivity <ol style="list-style-type: none"> 1. GSM/4G/5G 2. MQTT, Node-Red 3. REST API and Webhook 4. RFID/NFC 5. Bluetooth 6. LPWAN

Databases, Industrial communication protocols, Cloud Data Storage, Data Analytics, Data Visualization, and Dashboarding, Machine Learning, and Sensors.

Table 3 shows a ranking of the most commonly used enabling technologies and issues in the industrial sector.

Table 3. The rank of the most used enabling technologies and problems found in articles.

Enabling Technologies	Number of articles	Problems	Number of articles
Time series Database	20	Smart warehouse	7
Data Visualization and Dashboarding	18	Real-time Production monitoring and analysis	6
Cloud Data Storage	18	Cost and number of parts/component reduction	6
Data Analytics	17	Smart Scheduling	5
Sensors	16	Supply chain transparency and reliability improvement	5
Machine Learning	14	Predictive maintenance	4
Connectivity	12		
Signal Processing	11		
Industrial communication protocols	9		

The rank was created by ordering problems and enabling technologies based on the number of articles associated.

4 Conclusions

Industry 4.0 is forming smart factories based on information on demand as a result of the digital transformation, which is transforming the manufacturer journey.

The challenge is to develop new business models and services, and new products to use efficiently the potential that exists from humans and machines collaborate and to optimize the benefits of this collaboration.

Industry 4.0 enables companies to integrate their customers' needs and expectations into their development and production processes in novel ways, such as by direct data sharing with their machinery; it also makes machine data analysis simpler, which improves productivity and prevents production process failures. To fuel the 4.0 transformation, it's important to provide both the academic and industrial worlds with a clear picture of what's feasible and what's needed to make it happen. This taxonomy is a first step in the right direction. Despite the fact that this is a preliminary exploratory work, it will help in the explanation of the 4.0 environment and open the door to more investigation aimed at better understanding of how the 4.0 world is developing.

One of the possible future works to continue this research it's to create a dashboard with a search engine to query the taxonomy and analyze statistics about it. Another approach to continue the research it's also to make a survey with companies that are adopting Industry 4.0 solutions to analyze the current situation of smart factories.

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Entrepreneurial survivability during pandemic among micro-entrepreneurs

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Abstract. Entrepreneurs' survival strategies in developing economies before and after the Covid-19 pandemic were studied in order to identify micro-enterprises' actual pre- and post-pandemic situations. This paper examines the strategies employed by micro-enterprises to become competitive, the steps taken to overcome barriers and challenges, and the proclivity of companies to capitalize on current opportunities. This paper proposes that David J. Teece's dynamic capabilities theory can be applied through actions such as strategic collaboration with external stakeholders, the adoption of new technologies, ongoing research, and strategic networking. In this sense, knowledge enrichment on micro-enterprise business challenges and the skills they employ during unexpected crises, whether during a pandemic or outside of a pandemic period, can be improved. Furthermore, researchers can benefit from the increased understanding of the significance of dynamic capabilities.

Keywords: Pandemic, Survivability, Micro-enterprises, Dynamic Capabilities.

1 Introduction

The newly discovered Coronavirus (Covid-19) has rapidly spread around the world, affecting the global economy, industries, corporations, and micro-enterprises. Coronavirus first appeared in China and spread throughout the world, with a significant increase in patterns predicted to continue through 2021 without an end date [1]. Developing economies, such as Malaysia, are suffering from the spread of Coronavirus, and many businesses are being impacted by the pandemic's outbreak. Each entrepreneur faces unique challenges, survival skills, and tactics, not only during MCO but also before MCO hits developing economies. Most entrepreneurs, particularly those in micro-enterprises, will cease operations if the MCO is extended, resulting in an increase in the unemployment rate. According to the findings of a survey conducted on one developing economy, such as Malaysia, most businesses are likely to last less than three months if MCO continues [2].

There is no comprehensive statistical or official data on the impact of the pandemic on microenterprises in developing economies. Nevertheless, most micro-enterprises cannot survive without government assistance. For example, the Dewan Perniagaan Melayu Malaysia (DPMM) estimated that more than 53%, or 450,000, of the total 960,000 SMEs registered under the SME Corp have been severely impacted by the

pandemic and will be unable to survive without government assistance. Indeed, most micro-enterprises cannot survive the pandemic for more than two months, but, with government assistance, they could extend that [2]. The evidence is based on the findings of the special Survey (Online) effects of Covid-19 on Economy and companies/business firms, with the majority of respondents being micro-sales companies, with the highest percentage of business firms, 43.4 percent, followed by small-scale enterprises/business firms, at 9.1 percent and 7.2 percent, respectively, and medium and large, at 40.4 percent and 40.4 percent. According to the findings, 53.4 percent of respondents indicated that they could survive if they provided full-time/half-time paid leave to MCO employees. However, 67.8 percent of respondents reported no sales/revenues during MCO, while 12.3 percent of companies/business firms reported revenue from online sales/services and 9.8 percent reported revenue from on-site physical/shop sales. Furthermore, 42.5 percent of respondents estimated that if Covid-19 did not exist, it would take more than six months for their company/business firm to recover as expected. Another 28.7 percent estimated that it would take 4 to 6 months to recover, and another 1.9 percent said that their company/business firm would never recover and would be forced to close. Despite the fact that it is not an official statistic, it can provide an overview of the current situation.

The impact of MCO on micro-enterprises and the survival pattern is critical and should be investigated further for research insights. As a result, this paper is timely to achieve the main objectives: identifying the survival strategies of micro-enterprises during the crisis and providing the researcher with insights on the importance of micro-enterprises having survival strategies. The survival strategies of micro-enterprises during a crisis, and even during a pandemic, must be investigated further. The idea is that the pandemic affects most micro-enterprises, but a small percentage of firms survive the pandemic's extended duration of nearly one year. As a result, the surviving micro-enterprises deemed to have dynamic capabilities that allow them to thrive and survive even during a pandemic crisis.

Furthermore, because micro-enterprises can survive the pandemic, they will be able to survive longer and adapt to the challenging business environment. The impact of the Covid-19 pandemic crisis on micro-enterprises in terms of business continuity and recovery strategy should be investigated further [2]. Furthermore, it is hoped that it will establish long-term support mechanisms for SMEs, particularly during and after the crisis [2]. Government assistance is also important due to the loss of reliance on most small and medium-sized businesses and the need to close some of the premises and bear liabilities if there is no government intervention.

Government assistance is common, as some micro-enterprises reported "zero revenue" following the MCO's total business lockdown. Cash flow imbalances occur because owners must continue to incur mandatory expenses such as employee salaries, business loans, rental fees, utilities, and other fixed costs. Although commercial banks have offered a six-month moratorium period on all business loans, not all businesses are eligible. They use different types of financing, such as financial leasing. As a result, micro-enterprises must be dynamic in order to survive both during and after the pandemic. This can be seen when there is a transformation in the process, efficient resource management, strategies used in order, and effectiveness in addressing challenges.

However, in developing economies, this area of study is still under-explored and thus requires attention.

2 Brief Review of Literature: Covid-19 and Entrepreneurship

To deal with the pandemic situation, an entrepreneurial mindset is required. This means that the entrepreneur must be innovative, risk-taking, and market appropriate. To be more specific, they must consider this from the standpoint of using the social network. They must generate new business ideas and fill a gap in the current market. Being a creative entrepreneur by thinking outside the box and discovering new ways is critical to Covid-19's crisis prevention measures, allowing them to become competitive advantages in the global marketplace [3], [4].

2.1 Impact of Covid-19 on SMEs

A pandemic not only affects public health, but it also has a direct impact on global economies and small and medium-sized businesses (SMEs). The OECD Center for Entrepreneurship, Small and Medium-sized Enterprises, Regions, and Cities (CFE) studied the impact of Covid-19 on small and medium-sized enterprises and observed countries' efforts to improve SME survival strategies. The impact of the Covid-19 pandemic on small and medium-sized businesses is clear in terms of demand and supply, and financial markets will see further declines in confidence and credit cuts. In response to these issues, several policies are put in place, such as temporary tax breaks or direct financial assistance to small and medium-sized businesses. Emerging support packages that anticipate emergency loans to assist SME clients as well as the flexibility to repay existing loans are widely used in Korea, Singapore, and Malaysia. In Italy, the Italian Banking Association, in collaboration with the Business Association, has proposed a large-scale moratorium on the repayment of debts and mortgages, as well as the repayment of small loans and revolving credit lines for businesses, if the government agrees [5].

Non-essential enterprises facing temporary closure and mass movement are prohibited worldwide in response to the MCO. As a result, 70% of small and medium-sized enterprises in developing economies such as Malaysia reported a 50% drop in business within a week of the MCO's implementation. There are, however, a variety of cases involving businesses that use the online platform during this time period. For example, online food shopping increased by 53%, online grocery shopping increased by 144%, and online food delivery increased by 61%. Since the launch of food delivery services with strategic partners such as GrabFood and FoodPanda during the MCO period, there has been a 30 percent increase in orders, contributing to the growth of e-commerce in 2020 [6].

This indicates that the digital economy grows positively during MCO, making it important for small and medium-sized businesses to participate in the digital economy in order to increase their chances of survival and success during the pandemic. The agriculture industry in developing economies, such as Cameron Highland in Malaysia, is the best example of a business that has survived this period of containment. Farmers

were unable to sell their products due to logistical and transportation constraints, and thus had to dispose of them due to storage constraints. Eventually, they turned to other options, such as strategic partners and e-commerce platforms like Lazada, and they were able to sell 70 tons of products in three weeks [6], [7].

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However, online platforms face challenges because employees must work from home (WFH) during MCO. As a result, 84% of SMEs face challenges during the WFH process due to poor online connectivity [8]. Eventually, productivity is low, efficiency is low, and there is a lack of motivation to do business during MCO. In response to the SME digitization crisis, the Malaysian government launched the PRIHATIN Economic Stimulus Package, which includes 28 initiatives, the majority of which are financial in nature. MDEC has also collaborated with 237 local technology companies, including network providers, e-commerce platforms, and technology service providers, to provide discounts to encourage SME digitization. However, only 25% of Malaysian organizations are successful in response to the PRIHATIN Economic Stimulus Package, while 60% slow down. This indicates that there are obstacles that prevent such efforts from succeeding [9].

2.2 Business Losses Patterns and Industries Affected During the Pandemic

Travel restrictions and aversion to travel risk impacted tourism-related sectors, while interference with production in the global chain was dependent on manufacturing and exports. Economic activity fell as non-essential service providers' operations were halted and manufacturing firms' operating capacity was reduced. Consumption and investment activities have been hampered because social and recreational activities will be limited during the MCO. Aside from that, the commodity sector has been impacted by sharp drops in crude oil prices and volatile fluctuations [11]. Because of declining market demand and supply chains in the seafood industries, the pandemic outbreak had an impact on the aquaculture sector [13]. A decrease in household income leads to a decrease in purchasing power [14]. The MCO's extension has also had a significant impact on the tourism and hospitality industries. Flight operations have been suspended, and employees from various hotels and resorts are entitled to unpaid leave [15]. It had a negative impact on the developing economy. Malaysia recorded significant losses of RM3.37 billion in the first two months of the year 2020 as a result of massive cancellations of travel and tour packages, severely affecting hotels and airlines. As a result, Malaysia's GDP fell from 0.8% to 1.20%, or from RM 10.8 billion to RM 17.3 billion [15]. Researchers proposed that, as a result of the impact of the Covid-19 movement control order, enterprises performing various business activities obtain a broad spectrum of activities, implying that different industries assist researchers in better understanding the study issues [1].

The level of vulnerability varies greatly for low-income workers, minority business owners, and business owners with less educational involvement—minority-owned businesses are particularly vulnerable due to their low sustainability. Furthermore, business owners with a lower education level were vulnerable because their businesses were

in less resilient industries, such as construction and services (repairs, maintenance, and laundry services). Furthermore, 40 percent of small businesses (those with fewer than 20 employees) are more likely to close permanently in the first four months of a pandemic outbreak than firms with 100 to 499 employees with less than 5% of employees [12].

3 Discussion

3.1 Dynamic Capabilities as an Effective Solution for Solving Entrepreneurs' Obstacles

To capture the impact of the recent pandemic crisis on the capacity of developing economies, research is being conducted to investigate the economic crisis effects on SMEs Dynamic Capabilities. According to the findings, micro-enterprises are becoming more effective at utilizing resources and capabilities during times of crisis [16]. Another study looked at the relationship between the digitalization of small and medium-sized businesses and their public crisis responses. The findings revealed that digitalization enables small and micro enterprises to respond effectively to dynamic capabilities [17]. When dealing with a rapidly changing environment, dynamic capability is defined as the ability to build, integrate, and reconfigure internal and external resources. It is critical to the long-term viability of businesses in a changing environment. As a result, crises have created yet another opportunity for businesses to demonstrate their full potential by employing the principle of dynamic capabilities.

There are three emerging dimensions of dynamic capabilities in response to the crisis: the ability to sense the crisis, seize new opportunities arising from the crisis, and reconfigure resources to deal with the crisis. The arrival of the Covid-19 pandemic is undeniably unexpected for all businesses. However, some businesses are aware of the outbreak and believe that the onset of the pandemic will have a significant impact on business. The extent of the crisis will have an impact on day-to-day operations, such as disruptions in production and distribution, market failures, and staff shortages [18]. The greater the likelihood of survival during the crisis. Understanding the crisis is critical so that strategies for responding to the crisis can be developed ahead of time. It may be related to the first dimension of dynamic capabilities in a crisis [17].

When firms engage in dynamic capabilities, the likelihood of identifying new opportunities arising from the crisis appears to be higher. Social patterns are being broken, and new business opportunities are being created. For example, the pandemic's impact on business (some firms had to close) paved the way for the emergence of online business. Adopting dynamic capabilities can result in golden opportunities. As a result, the likelihood of new knowledge from the external environment is relatively high, encouraging firms to rehabilitate their businesses in line with the crisis in order to increase their chances of survival. For example, during a pandemic outbreak, most businesses can be seen providing delivery services due to the situational factors that prevent people from going outside. They can only enjoy the products and services while remaining in a safe zone via delivery. It is a new business opportunity that every company should consider in order to increase revenue [17].

Unifying firms can achieve the third dimension of dynamic capabilities, which is resource reconfiguration. From there, internal and external resources can be mobilized to address the crisis. Researchers agree that the Business Model Innovation (BMI) process is much easier in micro-enterprises than in larger firms because micro-enterprises are much more flexible for BMI to occur. Small and medium-sized businesses, unlike large corporations, can adapt to new rules due to their unique characteristics. According to this paper, firms can improve their performance by implementing a new business model that includes value creation, value proposition, and value capture. However, due to the nature of micro-enterprises, which can generate lower incomes than large corporations, there may not be enough resources and skills. As a result, they are not strategically oriented, and redesigning their entire business model can lead to increased risk, which some cannot bear [19].

4 Conclusion

The importance of dynamic capabilities in micro-enterprises was investigated in this paper. Micro enterprises are important because they create long-term employment opportunities and contribute to developing economies. In this regard, the government should focus more on assisting micro-enterprises to survive in a crisis. Furthermore, micro-enterprises must restructure their operations by implementing necessary improvements, such as digitization. This can be accomplished by collaborating with strategic partners such as Grab, Foodpanda, Shopee, Lazada, and others. In light of the fact that micro-enterprises are being forced to close their doors due to continuous losses as demand has declined, they must identify various alternatives that are appropriate for the critical situation. It is during a crisis that the full potential of micro-enterprises can be realized. People are aware that the pandemic reduces the likelihood of micro-enterprises surviving; however, micro-enterprises can still make a massive comeback by adapting to market changes. It is therefore critical for micro-enterprises to have entrepreneurial leadership qualities in order for them to survive.

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Challenges of Implementing Zero Waste Strategies in the Gastronomy Industry

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Abstract. This case tells the story of the Café spurlos which aims at becoming a zero waste business and thus making a significant contribution to combating one of the greatest challenges facing society today: the transformation of the economic system into a circular economy. Besides the COVID-crisis and the thereof resulting issues, the café also faces challenges related to its vision of incorporating the zero waste philosophy in its concept. The case explores the complexity of zero waste, analyses further hurdles for zero waste endeavors in the gastronomy industry and illustrates the constant balancing act of social businesses between staying true to one's mission and catering to the needs, wants and expectations of the market.

Keywords: Zero waste, sustainability, gastronomy industry, social entrepreneurship

1 Introduction

It was a beautiful day in February 2020. One of those days that make you aware that spring is just around the corner. Tamara opened the Café spurlos – freely translated to “Café without leaving a trace” – for the first time. It was the start of her mission to run a zero waste restaurant. A place for people to meet, mingle and relax, but also a place where sustainability is in the center of everything. The smell of fresh coffee was in the air and the sound of people chatting and discussing filled the room. That was one year ago. Today, the café is empty. The chairs are on the tables, the coffee machine is still. Far and wide there is not a soul to be seen.

It was most definitely not an easy start for Café spurlos. The COVID-pandemic has hit the gastronomy industry hard. Only a few weeks after its opening, the Swiss government ordered all restaurants to close temporarily. The re-opening was possible later in May, but under strict restrictions. In November 2020, the café had to close down again in face of the second wave of the pandemic. However, the COVID-situation was not the only hurdle for the Café spurlos. It quickly became clear that its vision of becoming a zero waste operation also comes with challenges.

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2 Case Study

2.1 The Story of Café Spurlos

That the Café spurlos shall be as sustainable as possible was kind of an obvious decision. The café was founded by and is located within the Impact Hub Basel, a global network of more than 16'000 members in 100 hubs in over 50 countries worldwide. The Impact Hub Basel has the aspiration of supporting a community of social entrepreneurs and sustainable innovators through events, coworking and a variety of incubator and accelerator programs. All of its activities are centered around the UN Sustainable Development Goals (SDGs). It was therefore clear that also its café shall be grounded on those values. However, creating as little waste as possible is an ambitious endeavor that requires a lot of know-how. Thus, the Impact Hub Basel decided to get an academic partner on board to observe and test how their vision could come to life in the most effective and efficient way. That is how the “Zero Waste Innovation Lab (ZEWIL)” was born.

The ZEWIL is a state-funded collaboration between the Impact Hub Basel and the University of Northwestern Switzerland (FHNW). The project aims at supporting economical processes and zero waste innovations in the gastronomy industry, which reduce waste and the overall use of resources. The Café spurlos is at the center of the ZEWIL and all activities of the project are structured into four components. Firstly, “research and documentation”, whereby Café spurlos’ concept and business serve as a platform and research object at the same time to test, evaluate and analyze zero waste strategies and solutions in the gastronomy sector with the goal of making the Café spurlos a profitable business – from an economic as well as from an ecological and social point of view. This part of the project is under the responsibility of the FHNW. Secondly, the Impact Hub Basel is in charge of the components “education and awareness” and “innovation and experience”. Thereby, the Impact Hub Basel organizes events and workshops around the findings of the ZEWIL project as well as an accelerator program for entrepreneurs focusing on zero waste in the gastronomy sector. Lastly, the aim is to develop a scalable business model whereby the acquired knowledge can be implemented in the industry through consulting services or similar.

Tamara was very excited to be a part of the ZEWIL as the manager of the Café spurlos. She had previously worked in the gastronomy industry, but it was always her desire to make more of a difference with her work. The ZEWIL seemed like just the right opportunity to do so. She was highly motivated to start this journey towards a zero waste operation and was very happy when Simon joined to support her in the management of the café.



Fig. 1. Tamara and Simon

2.2 Zero Waste – What Does That Actually Mean?

Besides the resulting issues of the COVID-situation, Tamara and Simon also soon faced the first challenges related to their task of incorporating the zero waste philosophy in their concept. Zero waste is not a protected term and as a result, there is no universal definition of it. Therefore, the first question that arose for Tamara and Simon was: “What does it mean to be a zero waste restaurant?” The most widely used and accepted definition of zero waste was developed by the Zero Waste International Alliance (ZWIA) in 2002 and has since been further elaborated. The most current version is as follows:

“Zero Waste: The conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health.” [19]

Therefore, zero waste maximizes recycling, minimizes waste towards zero, decreases consumption and strives towards products that are designed to be reused, regenerated, repaired and recycled internally or back into nature or the marketplace [9]. However, zero waste focuses on all kinds of resources and is therefore closely related to the concept of sustainability, which aims at respecting environmental, social and

economic aspects simultaneously. Also, zero waste refers to the entire value chain of a product – from sourcing all the way to the disposal – and hence also is in line with circular economy principles. Furthermore, the definition of zero waste has evolved over the years and the focus has shifted from recycling to maximizing the reuse of materials and the efficiency thereof.

Moreover, the Zero Waste International Alliance also developed the "Zero Waste Hierarchy", which describes a progression of policies and strategies to support the zero waste system, from highest and best to lowest use of materials [18].



Fig. 2. The Zero Waste Hierarchy 7.0 [18]

While the “Zero Waste Hierarchy” was developed for general application, there are no further guidelines around the concept specifically tailored to the gastronomy industry. More so, zero waste is often equalized with food waste. However, zero waste goes much further than that and includes the conservation of all types of resources involved and used in a restaurant operation – not solely food.

2.3 When Complexity Makes Things Complicated

The managers of Café spurlos began to realize that their ambition of opening a zero waste café was a lot more complicated than they had initially thought. The complexity of the zero waste concept and the fact that the entire value chain of a product has to be considered in order to evaluate its level of sustainability makes it very hard to incorporate and respect zero waste principles in all decisions and activities, Tamara elaborates. Often it is very non-transparent how, where and under which circumstances a product was produced, transported and processed. Really digging into this information is not only complicated, but also extremely time-consuming and not rarely simply impossible. Hence, just sourcing “standard” products from large suppliers is simply the easiest and fastest way. That is one of the reasons why Tamara and Simon think that joining forces is crucial for the gastronomy industry in its striving towards a more sustainable future. At the moment, there is no real sharing of knowledge between hospitality organizations around the topic. That is particularly relevant given that the hospitality industry in Switzerland is a distinct SME sector, dominated by independent micro-enterprises with only very few employees [15, 7]. As a result, those types of operations also only have very little negotiation power in terms of sustainability and zero waste policies, regulations and standards with their respective suppliers. Moreover, it cannot be overlooked that the effort for sourcing a product does not depend on the purchase quantity. Making sure the 2 kilograms of apples you sell in your café per week are as sustainable as possible does take as much time and effort as when you sell 100 kilograms per week. That makes it even more challenging for small operations like the Café spurlos to be truly “zero waste”.

On top of that, legal requirements, particularly related to food safety, often stand in the way of making a restaurant operation more resource-efficient. Simon explains: “Even if you are very determined to reduce food waste, it is not easy. The options are limited because under the Swiss food legislations, food that has been presented on a buffet has to be tossed after a certain amount of time and leftovers from i.e. a catering cannot be re-sold.” While those restrictions may make sense from a food safety point of view, they definitely hinder the gastronomy industry in its sustainability endeavors.

2.4 Determining What Is Right

How challenging the complexity of zero waste is became especially visible in the development of the café’s offer. In the conceptualization process, Tamara and Simon asked themselves what products they actually want to put up for sale and according to which standards and criteria they should be chosen. When looking at the “Zero Waste Hierarchy” pyramid, they realized that they were currently on the first stage of the process: “rethink and redesign”. They were trying to put together an offer that conserves and protects all resources in the sense of the zero waste concept. “What even is a zero waste offer? What is a sustainable diet and what would a sustainable food system look like?”, were questions the managers of the café asked themselves. That is when it became apparent how difficult it is to assess the “sustainability” of a product in its entirety, since that is the result of the simultaneous consideration of ecological, social and

economic factors. According to the FAO, economic impacts on sustainable food systems are i.e. profits, generated jobs, tax revenues or food supplies. Environmental impacts can i.e. be the carbon and water footprint, soil health, animal health, food waste, biodiversity or toxicity; whereas social impacts to be mentioned are i.e. added value distribution (gender, youth, indigenous people), cultural traditions, nutrition and health, worker rights or animal welfare [6]. Thus, all of those factors have to be respected and catered to at the same time in order to be as sustainable as possible. Moreover, at the 2010 conference "Biodiversity and Sustainable Diets: United Against Hunger," jointly organized by FAO and Bioversity International, the following definition of sustainable diets was agreed upon:

"Those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources." [5]

It thus became clear that due to the various factors that need to be taken into account, it is very difficult to establish blanket "rules" that make a culinary offering sustainable. However, three main guiding principles have been identified to be efficient in terms of optimizing the use of resources from a scientific point of view:

1. **Plant-based:** In order to reduce CO₂ emissions as much as possible, a largely "plant-based" food offer is key. Undoubtedly, meat and dairy products cause by far the highest CO₂ emissions of all types of food [14]. Particularly beef has an unsurpassable impact on the planet's greenhouse gas emissions and also requires more water and land in its production than any other single food product [1]. However, when it comes to nutrition, health aspects naturally also play a central role. The EAT-Lancet Commission looked into this very issue and researched what a "Planetary Diet" - a diet that simultaneously offers the most benefits for the environment and for people - should look like. Such a diet should optimize health and thereby enable people to be in a state of complete physical, mental and social well-being while the respective food production should stay within the boundaries defined in order to decrease the risk of irreversible and potentially catastrophic shifts in the Earth system. The Commission concluded that such a diet should be largely plant-based flexitarian and include only a small amount (approximately 13% of the daily caloric intake) of animal products [3].
2. **Seasonality and Regionality:** There are two types of seasonality: globally seasonal (i.e. produced in the natural production season but consumed anywhere in the world) and locally seasonal (produced in the natural production season and consumed in the same region) [11], which is why seasonality and regionality go hand in hand. One would assume that locally seasonal produce is more beneficial from a sustainability point of view. Generally, that is true given that globally local products can have a high environmental cost in the country of production in terms of water or land usage. But the reality is not that simple. Those foods also come with nutritional benefits since they offer a more varied and consistent supply of fresh products all year around

[11]. Moreover, it is widely believed that transportation is a main contributor to the ecological footprint of produce. Research shows that air transport in particular indeed has a strong impact on the ecological balance. However, the vast majority of goods from overseas are transported by ship, which does not have a particularly relevant impact on the footprint [13]. Another factor that can impact the eco-friendliness of seasonal food is whether or not the products were grown in a heated greenhouse [2]. Moreover, the consumption of globally seasonal produce might also support communities in producing countries that highly depend on agricultural trade. However, such food might often be produced under more than problematic working conditions.

That illustrates how many small factors determine the sustainability of a product and thus also makes clear that what is the most resource-friendly option has to be evaluated on an individual case-to-case basis. Overall, it can be said that the consumption of seasonal and local produce only matters little for total CO₂-emissions. The choice of the actual food holds definitely more importance in that regard and a more plant-based diet will therefore always have a much larger impact regardless of seasonality and regionality of the products [14]. However, if one really wants to make difference, one also needs to take care about what animal products are replaced with and under which environmental and social circumstances those have been produced [1].

- 3. Fair Production:** Under which conditions food has been produced and whether or not those circumstances can be considered humane, inclusive or fair is extremely hard to evaluate as a consumer and as a restaurant manager alike. However, operating under zero waste principles also includes using human resources as efficiently and sustainably as possible. Therefore, protecting workers' rights and paying adequate salaries to producers are crucial factors [4]. The easiest way to ensure those requirements are met, are respective certifications such as i.e. Fair Trade. However, the vast number of labels and standards arguably guaranteeing fair production can be overwhelming and their effectiveness hard to assess. On top of that, they also come with drawbacks. Producers must meet increasing requirements for certification which comes at a price that is often not feasible for small businesses and farms in developing countries [17]. On the other hand, that of course also results in higher purchasing and respective selling prices of the food products.

2.5 Zero Waste Can Never Be Perfect

When taking a closer look at those three guiding principles, Tamara and Simon learned quickly that in the context of sustainability and zero waste, there is a counter-argument for everything. The vegan diet is the most ecological, but not necessarily the healthiest one. Organic meat is better for animal welfare, but causes more Co₂-emissions per kilogram compared to meat from conventional production. Consuming products from overseas is not necessarily environmental-friendly, but supports communities that highly depend on the export of their agricultural produce. It became obvious that zero

waste can never be objectively perfect. Given the interdisciplinary nature of the sustainability concept, which aims at respecting ecological, social and economic factors equally and at the same time, there will always be certain compromises that have to be made. Moreover, the café also faced the challenge of being economically profitable while incorporating the philosophy of zero waste. “The quality has to be right. If the coffee is super sustainable, sourced fairly and served in a reusable cup but then tastes like crap, nobody is going to come”, says Simon. Moreover, guests also have certain expectations. Even though coffee has to be imported and production conditions might often be critical, it is a product that undoubtedly has to be part of the offer in order for a café to have a chance to be financially successful. The same goes for having a largely plant-based offer. The managers had sincere doubts that their customers would be satisfied with a menu largely free of any animal products. Those dilemmas between customer expectations and sustainable management practices have also been studied in scientific literature. A recent study i.e. has found that particularly young employees in the hospitality industry are eager to incorporate eco-friendliness and thus highly motivated to reduce food waste. However, in pursuit of customer satisfaction through fresh produce, they tend to accept and follow the given cultural workplace waste norms – which do not necessarily aim at reducing food waste - despite their actual beliefs [10].

Tamara and Simon also came to realize that depending on the quantity, sourcing locally can be challenging. Regional produce is limited and therefore, larger amounts are often not available. That makes the sourcing process unpredictable, unreliable and thus even more complex, which can easily scare off restaurants trying to be more sustainable. Sourcing foodstuffs from fair production was important to the café managers too. However, they were also aware that guests are only willing to pay a premium for a sustainable product up to a certain degree.

Undoubtedly, to guarantee that a product is truly and fully sustainable, supply chain transparency is key [8]. The process that a product has undergone before it ended up on a customer’s plate needs to be traceable to ensure that it corresponds with the desired ecological and social standards - and hence zero waste principles - along the entire value chain. Given the immense amount of information and the high level of complexity, that is anything but an easy task. However, recent research suggests that Blockchain technology might be a well-suited tool to enable traceability – and hence transparency – of supply chains [i.e.16]. Moreover, it has been found that Blockchain hence has the potential to increase supply chain sustainability performance [12]. It therefore seems like technology and respective systems hold great potential to profoundly influence the way in which decisions over resource use and commodity trade are made [8] and could therefore also dismantle at least some of the barriers in terms of implementing zero waste strategies in the gastronomy sector. i



Fig. 3. The terrace at Café spurlos

2.6 Excited for the Future

The complexity and the simultaneous interaction of so many individual factors became more and more overwhelming and challenging the further the conceptualization process of the Café spurlos progressed. Evidently, being a zero waste operation is a constant balancing act between staying true to its mission and cater to the wants, needs and expectations of its customers. Also, it became clear to Tamara and Simon that zero waste has boundaries and they have learned quickly that frustration is now part of their job description. However, Tamara says, “zero waste is a matter of the heart. Our motivation is intrinsic, we do this because we believe in the cause, because we want to make an impact.”

Now, in spring 2021, it seems like there is finally light at the end of the COVID-tunnel. The Café spurlos team has made the best use of their forced break and worked out a solid concept for their business. “Once everything is back to normal, we will hit the ground running. This is what we are passionate about - it’s as simple as that”, Tamara concludes. If only it was.

3 Teaching Notes

3.1 Learning Outcomes

The objective of this case study is to expose students to the concept of zero waste and the implementation thereof in the gastronomy industry. Moreover, they will examine the complexity of the zero waste concept and learn more about the challenges and hurdles on the way to incorporating the zero waste philosophy.

3.2 Questions

1. What are the main challenges of conceptualizing a zero waste café?
2. What next steps could Café spurlos take towards their vision of becoming a zero waste operation?
3. To what extent do you think zero waste is achievable and what role does that play in the context of sustainability overall?
4. How do you think the COVID-crisis affects the zero waste movement in the gastronomy sector and beyond?
5. How could technology and particularly the integration thereof help overcoming the identified challenges and make the implementation of zero waste principles more effective and efficient?

3.3 Model Answers and Analysis

1. What are the main challenges of conceptualizing a zero waste café?

The challenges are manifold. Firstly, the fact that “zero waste” is not a protected term and its definition therefore somewhat subjective makes it challenging to even establish the determining factors of what a zero waste café should be and what requirements it should fulfil. Even if one was to come up with a definition, the communication thereof to the customer remains challenging. Another significant hurdle is the complexity of zero waste. The fact that the entire value chain of a product has to be considered in order to evaluate its level of sustainability makes it very hard to incorporate and respect zero waste principles in all decisions and activities. Moreover, information regarding the sustainability of products is untransparent and thus difficult and time-consuming to gather. On the other hand, zero waste centers around reducing all kinds of resources. Hence, social, economic as ecological factors have to be respected simultaneously. As a result, there is a counter-argument for nearly anything in the context of zero waste. On top of that, due to the small-structuredness of the industry, implementing zero waste practices is time-consuming and can potentially be frustrating due to little negotiation power and impact on policies and regulations. Also, there are certain legal requirements that might stand in the way of becoming a more sustainable operation.

2. What next steps could Café spurlos take towards their vision of becoming a zero waste operation?

This question could be answered in many different ways and might stimulate creative solutions and approaches. Potential directions could include the development of a clear concept and a definition of what a zero waste café is in that context, goal setting, measuring waste, community building with other players in the industry, entering partnerships or the development of a circular system. This question might also be a good opportunity to start a discussion around what requirements a zero waste café should fulfil and what social, ecological and economic factors should be considered simultaneously.

3. To what extent do you think zero waste is achievable and what role does that play in the context of sustainability overall?

The case of the Café spurlos has clearly shown that zero waste can never be perfect because of the complexity of the concept and the many different aspects that have to be combined and respected simultaneously. Also, the term zero waste can be confusing because not creating any waste at all seems somewhat utopian and unrealistic. However, the hierarchy of zero waste might be a good indicator of prioritizing different zero waste strategies and might be the best way to optimize one's waste generation and management.

Zero waste is very closely related to the concept of sustainability. In order to achieve sustainability, zero waste practices are inevitable. Therefore, the challenges of implementing both concepts are also very similar. Just like zero waste, sustainability is highly complex and requires to combine a variety of aspects.

4. How do you think the COVID-crisis affects the zero waste movement in the gastronomy sector and beyond?

On the one hand, the COVID-outbreak and the resulting crisis might have increased the awareness for sustainability-related issues and at the same time strengthened people's appreciation, consciousness and mindfulness for both nature and social community. Those changes might also be translated into the gastronomy sector and increase the activities and endeavors related to sustainability and zero waste. On the other hand, the new requirements, circumstances and habits due to the COVID-situation definitely also had negative impacts in terms of waste creation. In the gastronomy industry, especially one-use hygienic items such as masks, paper towels or gloves generate a considerable amount of waste. Not to be forgotten is the take away packaging that has become crucial during COVID and obviously is a very wasteful practice as such.

5. How could technology and particularly the integration thereof help overcoming the identified challenges and make the implementation of zero waste principles more effective and efficient?

One of the main challenges that Tamara and Simon encountered is the complexity of zero waste and particularly the non-transparent supply chains that make it hard for them to truly assess whether or not a product really complies with Café spurlos' philosophy and requirements. The traceability of food products as well as the evaluation and prioritization of sustainability criteria requires highly specialized knowledge and is also a very time-consuming process. Thus, it is evident that the complex system of different factors that influence zero waste strategies in the gastronomy industry need to somehow be connected and analyzed in a structured and automated manner. This shows the importance of technology integration and particularly the need for a system of intelligent technology in connection with human society to tackle sustainability issues.

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Prospective Synergy Between Bangladeshi SMEs and Smart City: Through the Lens of Society 5.0

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Abstract. Rapid urbanization in the emerging markets necessitates utilizing the scarce resources more reasonably and sustainably, for which technology adaptation is imperative. Despite this, the emerging markets suffer from weak technology and lag from realizing entrepreneurial opportunities inspired by a human-centric concept of Society 5.0. The key research aim is twofold. First, to explore the possibilities of transforming the emerging markets into smart cities in Bangladesh. Second, the potential of introducing and operating Smart SMEs in the smart cities as a pre-condition to embrace Society 5.0 for ultimate wellbeing for humans across the emerging economy. The study adopts a clustered content analysis method, followed by collection and classification of the relevant extant literature on the urbanization status of Bangladesh, Smart City, and Society 5.0. The literature review suggests that, with the right digital solutions, Society 5.0 may inspire to build a more versatile set of SMEs of the future: Smart SMEs. The study formulates a framework addressing Society 5.0-inspired Smart City's potentials in the emerging markets to create Smart SMEs. The study pioneers in offering Smart SMEs approach to fit in the concept and proposes a new definition of 'Smart City' based on its rapport with emerging markets. The study foresees a meaningful implementation of Society 5.0 to create transformational value among other emerging Asian nations, including Bangladesh. New directions of future research to empirically test the connections to address diverse social and human needs are also suggested by the study.

Keywords: Smart City, SMEs, Society 5.0.

1 Introduction

On the edge of Industry 4.0, the Emerging Markets (EM) have turned into melting pots for entrepreneurs. The vision of creating a more equitable, livable, and sustainable world has led the researchers to accentuate the multidisciplinary approaches of EM [1]. Urbanization in the EM is among the critical processes that deal with the urban concentration of the population. The exponentially growing city-based population must adapt to EM's technology for using scarce resources more reasonably and sustainably. The

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competitive edge of a city often is reflected by its novelty and economic sustainability. The cities from the emerging markets have been implementing ICT and other networked infrastructure to ensure more incredible business growth among the SMEs and the large incumbents to stay competitive. This competitive move leads to more significant entrepreneurial activity in a Smart City [2].

With better flexibility and adaptability, SMEs can play a critical role in boosting productivity and economic growth and equalize income distribution [3] in the urbanized economy. Those emerging markets often embellish the concept of Smart City [4], which has been acknowledged as highly entrepreneurial by scholars and policy-makers [5]. The nexus between city-based economy and entrepreneurship remaining multidirectional, the SMEs complements well with the smart cities [6]. Nevertheless, an analysis of SMEs' interaction and emerging economies, especially from Bangladesh's perspective, has been missing. This paper seeks to address the research gap by observing this relationship from the lens of Society 5.0, a human-centric approach for economic advancement. The study aims to address the social needs, which is a timely research-requirement.

2 Literature Review

2.1 Urbanization in Emerging Markets

Emerging Markets (EM) denotes a developing economy that progresses to a futuristic industrial economy from an agricultural and resource-dependence economy often followed by the industrial revolution. EM is characterized by unique features such as vast disparity of growth rates in urban and rural market growth rates, the evolution of socio-cultural trends, the emergence of bureaucratic and corrupted systems, and diffusion of innovations. Given the distinctive challenges and opportunities, EM is substantially differentiated from the developed markets. By investing in education, infrastructure, defense, social programs, EM aims for creating faster GDP growth, greater connection with global markets, and a better standard of living [7].

On the other hand, urbanization in the EM refers to a social process that triggers the urban cities to grow and the societies to adopt city-based lifestyles and culture with the migration of the population from rural to urban areas. Global urbanization is led by the rise of city-based world population from 30 percent in the 1950s to 50 percent in 2011. It is predicted to rise to 70 percent before 2050, according to the United Nations report (2012), and this is more prevalent among the emerging and developing economies [5]. In 2020, the urban-dwellers were 38.2 percent of the population of the developing and emerging country, Bangladesh. The urban population is growing at a 1.9 percent rate [8]. Despite the faster urbanization in Bangladesh compared to the other South Asian countries between 2000 and 2010 [9], the country has experienced messy urbanization, with some 47 percent of the urban population belongs to slums [10]. In terms of the 2020 global livability index, Dhaka has been positioned as the 3rd among the worst cities [11] [12].

To overcome rapid urbanization challenges, including resource-scarcity and infrastructural inadequacy [13], SMEs can enhance their GDP contribution. To realize the value and potentials of SMEs in Industry4.0, adopting new technologies is imperative.

SME entrepreneurs need to emphasize updating their technical and data-related skills to operate in dynamic and competitive environments. At the global level, about one-third of the skills are subject to be obsolete following the skill-disruption trends over the next half-decade [14]. The universities, SMEs, corporations, and citizens should enthusiastically participate in the skill up-gradation process. It can be inferred that a successful implementation of smart cities will work as a catalyst of SME development in Bangladesh's emerging economy.

The recent trends indicate the readiness of Bangladesh to create emerging markets. Besides standing as the fastest growing economy of the Asia-Pacific; stable governance and policies regarding taxation, economic, and foreign trade, the low-cost labor, and a gradual shift towards information and communication technology (ICT) industry and renewable power sources have played a significant role in forming its economic foundation [15]. Consequently, the mobile-friendly internet connection is accessible to general people with 4G internet since 2018, which is expected to reach 51 percent by 2025 [16]. Another critical aspect of smart cities is cashless to ensure efficiency [17]. To convert more than 70 percent of Bangladesh's unbanked population [18] to cashless, mobile financial services are contributing to creating financial inclusion [19] among 50 million users, followed by a rise in mobile application-based services.

These changes make the lives of the users easier and prove to be a source of employment for Bangladesh's workforce. Another commendable act by the government of Bangladesh is the increased incentive (20-45 percent duty) to use fuel-efficient and environment-friendly hybrid cars instead of regular ones (100-300 percent duty) [20]. In the emerging markets, smart cities' creation will enhance urbanization and make the cities more livable [4]. As a consequence of such a digital revolution with urbanization, the Smart City concept's interest has grown immensely. The information and communication technologies (ICT), policies based on high-tech infrastructures, and city-dwellers efforts to enhance the quality of lives have improved possibilities for cities to organize urban growth [2].

2.2 Smart City in Emerging Markets

A visionary goal of emerging markets to become a Smart City or even a Super-smart City leads the emerging markets' entrepreneurs to adopt robust and prudent means to use technology. The governments of many emerging markets have been progressing to create smart cities. Some 26 megacities from the largest emerging markets in the ASEAN region, including Singapore, Java, Bangkok, Jakarta, and Manila, have adopted the smart city concept, and most of them have started to experience the significant value of their investments already [4]. Therefore, the term 'smart city' has turned into a trailblazer that could be adopted in renovating the emerging markets. Nevertheless, the concept remains a fuzzy buzzword [21]. Some related terminologies such as eco-city, sustainable city, digital city, intelligent city, or knowledge city are often analogous to the concept. The concept's reasons to lack unanimity are that most of the definitions are centered on either technology or smart human-resources or smart collaboration between government and citizens [22], or even customer-centricity [4]. The following Table 1 offers different perspectives offered by various authors on the concept.

Table 1. Different Perspectives of Smart City.

Authors	Viewpoints of various authors
Giffinger et al. (2007)	A forward-looking and well-performing city with a set of intelligent features including people, environment, living, agility, governance, and economy, built by self-decisive and conscious citizens [23].
Caragliu et al. (2011)	A city that invests in human capital, social capital, traditional infrastructure, and modern communication infrastructure (ICT) and manages natural resources with participatory governance to fuel economic sustainability and quality of life [24].
Lombardi et al. (2012)	A city that generates intellectual capital, wealth, and regulations for university, industry, civil society, and government while stimulating the abilities of presupposition and knowledge-transmission as a prerequisite to innovation systems [25].
Bakici et al. (2013)	A city that actively generates innovative ideas by nurturing clusters and promoting 'living labs of competent citizens to co-create products or services [26].
Richter, Karus & Syrja (2015)	A clustered area of high concentration of novel knowledge by creative citizens and institutions and implementing a digital infrastructure aims to achieve economic sustainability and high quality of life concerning natural resources scarcity [5].
Lara et al. (2016)	A domain consisting of smart concepts including technology, transport-system, health-service, governance, and economy [27].
Angelidou (2017)	It promotes various phenomena, including technology-centric, human resources and entrepreneurs, information security, privacy, social status, management, networking, strategic framework, interdisciplinary arrangement, and generic collaboration [28].

The collaboration of private players, people, and policy-makers is a mandatory prerequisite to positively impacting smart cities [29]. The creative citizens often turn themselves to visionary entrepreneurs with IoT-based infrastructure [30]. Smart cities offer avenues for creativity, innovation [31], and entrepreneurial opportunities, followed by the profound rise of consumption and production patterns. While the ICTs and other network infrastructure direct the SMEs to realize new opportunities, they create new markets [32] and commercialize new ideas [29]. The policy-makers, corporate entrepreneurship [33], and citizen-led enterprises [30] play an enriched role in converting the emerging market into Smart City. Features specific to smart cities, including big data or open data, would foster open governance, accountability, transparency, citizen engagement, and economic progress. The infrastructure and entrepreneurial opportunities [34] and greater access to data lead to the uninterrupted creation of new firms [25] and turns the cities into seedbeds for innovation and entrepreneurship [5].

Nevertheless, as the emerging markets such as Bangladesh are still lagging due to the absence of a feeble technology-base to realize the Smart City concept fully, necessary policies should be introduced to accentuate protecting citizens' rights so that technology never supersedes humanity [20]. Therefore, a human-centered approach is what the emerging markets need to add to the Smart City approach.

2.3 Society 5.0

The most enhanced version of contemporary and human-centric society is Society 5.0, which emerged as Japan's strategic national political initiative to balance technological instruments of big data, AI, IoT, and robotics with economic growth resolve societal issues [35] [36]. It seeks to improve productivity via the digitization and redesign of business models and simultaneously builds society with innovation and globalization [37]. Society 5.0 is a process of value-addition to industrial and societal aspects [38]. The Sustainable Development Goals (SDGs) that focus on attaining sustainable humanity by mitigating their social problems complement Society 5.0.

To succeed, Society 5.0 needs to accentuate human control by integrating innovation policy (government), entrepreneurial spirit, and skills (civic society and innovative institutions) [39]. The transformation is expected to help humans live their lives easier and faster, greatly assisted by technology. Business transformation is accelerated by and built upon digital technologies and supports the businesses' experience more remarkable growth. Japanese Robotics market is anticipated to stand at USD 87 billion in 2035 from a mere USD 9 billion in 2010. Many Asian countries, including Malaysia, Singapore, Indonesia, are aiming towards a new human-centered society [40].

3 Methodology

The study objective is to address the nexus between SMEs and Smart City to create pre-conditions for Society 5.0 for humans' ultimate wellbeing. The study conducts an extensive review of the current literature, and the process is consistent with Richter et al. (2015) [5]. The study specifically seeks to understand the impact between SMEs and Smart City (see Fig. 1).

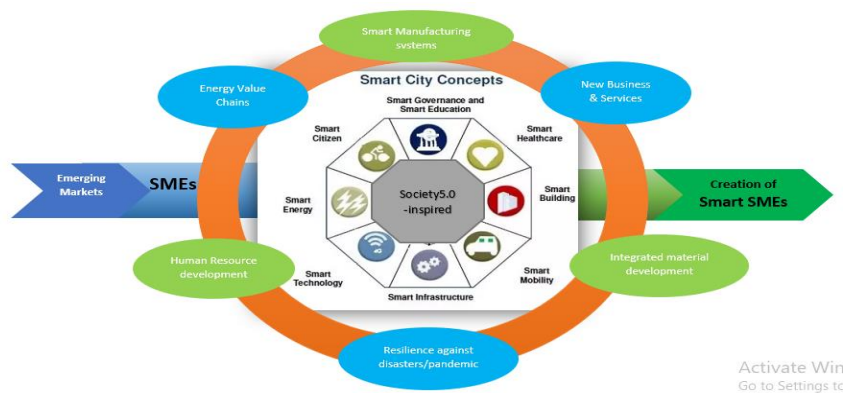


Fig. 1. Prospective Synergic Effect of Smart City among the SMEs.

A clustered content analysis method has been adopted as the study aims to investigate a research-domain that is not yet systematically studied. Based on the existing literature, the study will use a method to advance understanding of the phenomenon

and open up research avenues. A comprehensive analysis of Smart City's three-dimensional themes, SME 5.0, and the urbanization and economic status of Bangladesh has been conducted. The most relevant literature, published articles, conference proceedings, and book chapters have been considered for this purpose. Since the Smart City is an emerging yet trans-disciplinary approach with no established research-base, various management, economics, and business journals were considered accentuating urban communications, urban technology, and human resources. The present review was conducted in three stages [2]:

1. Searching of articles through Emerald, Google Scholar, ProQuest, and Web of Science databases using a set of search phrases such as "Society 5.0", "smart cit*", "SME and Urban Cit*" and "Bangladesh urban econom*" to identify relevant sources of information until 2021. The peer-reviewed articles were the prime focus.
2. Classification of the articles by further narrowing down the data set. It was ensured that those data set contains either of the terms, such as *entrepreneur*, *firm*, *SME*, *small business*. The stage further furnishes two different sets of articles on entrepreneurship (SMEs) and smart cities.
3. Clustered content analysis was conducted to explore emerging markets' entrepreneurial context to understand SMEs' influence on smart cities. The insights of the articles were divided into three distinct research-streams: (a) Urbanization, (b) Emerging Markets, and (c) Smart cities.

4 Discussion

4.1 SMEs through the lens of Society 5.0

To ensure human-centered problem-solving and value creation, a smooth merging of the "people with things" and the "real with virtual" worlds is necessary. This fuse will lead to transformational advances to various prolonged societal problems prevailing in the emerging economies. All related stakeholders of economic growth across the globe, including the governments and firms, anticipate the smart urbanization and technological changes will continue to trigger a positive environment for adopting Society 5.0 within the next few years by the emerging markets, which have been experiencing synchronized and real-time revolutions from the industrial and urban aspects. These revolutions accompanied by increased inter-relations and intra-relations among people and data will accelerate technological advancements. The robust shift towards the digital age has been occurring ten times faster and three hundred times the scale of the Industrial Revolution's societal transformation, leaving some three thousand times impact on human lives [41].

Society 5.0 can be a suitable catalyst to renovate and upgrade SMEs by empowering them to enhance the quality of life instead of just boosting technology's impact. Various concepts such as big data, the Internet of Things, and artificial intelligence are anticipated to convert to pearls of new wisdom through the process. Such revolution is necessary to create corridors of humanity and equity [42]. The possibilities created by the Japanese phenomenon are expected to address individual needs and resolve social problems from diverse-levels. As a result of its significant influence, the other Asian nations, including Bangladesh, can be hopeful to experience Japan's super-smart society's

transformational benefits, and the citizens may lead their lives easier, better and faster. To better respond to the challenges imposed by the messy urbanization and provide a tailored solution to the customers in the emerging economies, the citizens deserve a thorough understanding of smooth transition towards Smart City's concept with the light of Society 5.0 [43].

4.2 Potentials of Smart SMEs in Bangladesh

SMEs, as the economic backbone of an economy, enhances sustainable industrialization and employment. The contagion of the COVID-19 presents a significant threat to the SMEs of Bangladesh, requiring interdependencies among business, nature, education, and society to develop a readiness to operate, grow, and survive in the post-covid economy [44]. With a greater approachability towards financial sources, social and professional networks, or entrepreneurial capital, the emerging markets can be expressed as smart cities for a one-stop-solution to innovation, productivity, humanity, and equity. The high-end resources, production factors, and the supply chain network's intellectual capital have remained conducive to business growth. The favorable business-environment further reinforces Smart City's competent vehicle-set, including the regulatory institutions, training establishments, public transportation, and healthcare [13]. Also, to be more responsive to citizens, the smart cities may adopt a quadruple-helix model, where (a) the government by allocating resources and planning policies, (b) corporations and universities by creating more experience, expertise, and know-how, (c) SMEs by initiating small-scale social improvements, and (d) the smart citizens by addressing various issues to resolve sustainably [30] [45].

Given the correlation between SMEs and emerging markets, the present study suggests a revised definition of Smart City: "a concept that instigates productivity, sustainability, equity, and livability among the citizens by giving them a voice and among the creative entrepreneurs by giving them opportunities to use digital infrastructure, all while keeping in mind about resource-limitation". If Smart City's concept is applied adequately and correctly in Bangladesh, the higher spatial and contextual proximity among the ventures will lead to knowledge spillovers. This implementation may effectively open the corridor to commercialization opportunities of innovation. The scenario, in turn, would lead to tremendous business growth and an 'innovative spirit' [46] among the SMEs. With the right digital solutions offered by the Smart City, the SMEs would be better able to fine-tune the 'innovative spirit', scale up their businesses, respond to the dynamic customer demands, and build a more versatile set of SMEs: Smart SMEs [40].

A combination of ICT, business-led urban development, government, and policy-makers will turn the Smart City of Bangladesh into a center of entrepreneurship and homeland of Smart SMEs [26]. Also, by acknowledging the resource-limitation of the urban cities of Bangladesh, the characteristics of social and environmental sustainability of Smart City will help create entrepreneurial opportunities for the Smart SMEs [2]. For the Smart SMEs to be effective, the Smart City must complement the knowledge-intensive sectors such as creative and tech-based industries. Also, as the knowledge-creating networks are primarily based on transferring and adopting tacit knowledge, the Smart City should connect with 'living labs' consisting of highly-educated

entrepreneurs [47]. The capital city Dhaka and port cities such as Chittagong, Khulna, and Sylhet offer more forward-looking possibilities for Bangladesh's economic activities and are among the fore-runners to embrace the Smart City concept.

4.3 Realizing Society 5.0 by Smart SMEs

To add value and realize the concept of Society 5.0 of a human-centric growth strategy, the entrepreneurs need to generate quality data first. By ensuring effective rapport between cyberspace and physical space [48], the Smart SMEs and Society 5.0 can be catalysts to each other. The growth of Smart SMEs can lead to market creation and economic development for smart cities. By realizing the benefits of Society 5.0 and operating in the smart cities, the limitations associated with spatial, socio-cultural, and financial factors are expected to reduce. Also, adopting innovative business models would trigger economic growth. Thereby the scope of Smart SMEs would be heightened in the emerging markets of Bangladesh [49].

For a resource-scarce economy like Bangladesh, rather than aiming to create unicorn startups with exponential-growth, dominating, and competitive attitudes, as coined by Aileen Lee in 2013 [50], the smart SMEs should emphasize being zebra SMEs that are sustainable, mutualistic, and promoters of social wellbeing with regenerative growth [51]. Initiated by four women entrepreneurs, as mentioned in the book named, "Starting a Revolution: what we can learn from female founders about the future of business" [52], the 'zebra movement' can be an excellent example for the women-owned SMEs as well. Smart SMEs are expected to arch their massive impact in the urban economy, being empowered by the big data revolution. Also, tapping into a rising consciousness among all the stakeholders, the SMEs could better tackle socio-economic challenges coinciding with the SDGs.

5 Conclusion

Being crucial actors and architects of the future Smart City in Bangladesh's emerging markets, the SMEs should make a conscious and continuous effort to collaborate the social and business welfares. By embracing technology and networked infrastructural makeover, the SMEs can turn to tomorrow's Smart SMEs to address the citizens and society. The values and promises of Society 5.0 are expected to eradicate the gaps associated with gender, language, culture, and region and address individual needs from diverse-levels. The SMEs being flexible, competent, and versatile sectors of the economy, can serve as catalysts towards an extraordinary digital transformation. Effective utilization of Smart SMEs will lead to greater sustainability of the smart cities. Considering the strong interdependences between Smart City and SMEs, detailed empirical studies to examine the association between various variables of the two domains from the emerging counties' context are suggested. Also, a continued review study may be conducted to offer recommendations to reduce the barriers to implement the Smart City concept in the light of Society 5.0.

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Islamic Economic Assumptions in the Context of Islamic Tasawur: A Preliminary Discussion

Andaian-andaian Ekonomi Islam Menurut Konteks Tasawur Islam: Satu Kajian Awal

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Abstract. This paper aims to determine whether Islamic economics's assumptions are in line with the concept of Islamic Tasawur. These assumptions are divided into two categories: a scarcity of resources and unlimited human wants. The philosophical pillars of Islamic economics assumptions have been adapted from Western or conventional economics, then Islamized and transformed into Islamic philosophy. As a result, the assumption by mainstream Islamic economic scholars of the scarcity of resources and unlimited human desire cannot be universally accepted because its essence differs slightly from that of the Qur'an and the Hadith. These Islamic economic assumptions must be examined based on the Quran and the Hadith. As a result, it is critical to discuss Islamic economics's premises consistent with the Islamic Tasawur.

Keywords: Economic Assumptions, Mainstream, Scarcity of Resources, Unlimited Human Wants.

1 Introduction

The Islamic tasawur represents the primary form of Islam and explains the accurate and complete principles of Islam in its entirety so that the person who understands it is instilled with them (Hanapi, 2020; Noor Hisham & Burhan, 2019). The essential elements of the Islamic tasawur are Allah SWT as the Creator, human beings as creatures, and natural resources as creatures (Mohd Zulkifli, 2020). According to previous scholars, Islamic law is derived for justice, peace, and goodness for humanity's benefit. Also, Islamic law is divided into several categories, including worship and muamalat. Muamalat is divided into several sections, one of which is economical. According to previous scholars, Islamic law is derived for the sake of justice, peace, and goodness for the benefit of humanity (Ika Yunia & Abdul Kadir, 2018; Sarmiji, 2020).

Islamic economics is a study of human behavior concerning the diversity of desires and scarcity of resources with alternative uses to maximize falah, human well-being,

both in today's world and in the hereafter (Zubair Hasan, 2020). Eventually, the Islamic economic system began to evolve, and the rule of Khulafa'ar-Rasyidin continued (Addi Arrahman, 2020). Economic problems are not so prominent at this point, and Islamic economic theories are still undeveloped.

The diverse contributions of these Islamic scholars have also led to the development of Islamic economics and its use in dealing with society's economic problems. They analyze existing knowledge to learn more about the nature of the relationship between the economic aspects and Sharia law rules and the causes and effects of specific common economic issues. These scholars also develop a better understanding of knowledge or theory on economic and non-economic matters. Thus, the emergence of different views and assumptions to find answers to economic problems, but there are still theories and assumptions of Islamic economics that are still bound up with the Western economy, or conventional economics, and are slightly in conflict with Islamic principles and values. Moreover, current Islamic economics is said to have no theory of its own, instead of relying on borrowed mainstream worldviews, where Islamic ethics and morality are not incorporated into Islamic economic methods and models (Choudhury, 2018; Rafikov & Akhmetova, 2020). This study will therefore identify the Islamic economics that is in line with the Islamic tasawur.

2 Literature Reviews

2.1 The Concept of Economics According to Islamic Tasawur

Islamic and Western scholars often discuss the origins of things. Similarly, the meaning of the tasawur and 'worldview' in specific terms has yet to be discovered in the tradition of classical Islamic thought. Even so, this does not exclude the use of the tasawur as a systematic basis for the understanding of reality by classical Islamic scholars. However, it differs from the use of specific terms by Islamic scholars in the twentieth century to describe the meaning of this tasawur (Mohd Shukri Hanapi, 2014).

Table 1. Differences in the use of the Islamic term Tasawur

Islamic Scholars	Terms
Qutb (1965)	Al-tasawwur al-Islamiy
Al-Zayn (1982)	Al-mabda' al-Islamiy (Tends to understand it as a doctrine of rational belief that leads to the formation of an ideology.)
Al-Mawdudi (1985)	Nazariyyat al-Islam
Al-Faruqiy (1995)	Al-tasawwur al-tawhidiy (More prone to the concept of Allah SWT's power and oneness in shaping all aspects of human life.)
Al-Attas (1995)	Ruqyah al-Islam li al-wujud (More prone to philosophical and epistemological meaning.)

Based on Table 1, the difference in these Islamic scholars' terms is due to a lack of more appropriate and accurate definitions. Islamic scholars, therefore, use the terms "tasawur" and "Worldview" to describe a way of life that encompasses both worldly and eternal realities within its scope, as well as Islamic adjectives. With the combination of the word tasawur and Islamic values, then the existence of the Islamic tasawur means a full or accurate picture of Islam, which seeks to explain the basic principles of Islam properly and comprehensively, to become the basis for a life-view and to be instilled in a person (Mohd Zulkifli, 2020). It is, therefore, necessary to determine the correct term tasawur in order to play a role in the formation of civilization because it affects the beliefs, opinions, and actions of society.

Debates presented by Muhammad Syukri Salleh (2002, 2003a, 2003b) were discussed. He claims that the three (3) basic elements of the Islamic tasawur are Allah SWT as Creator, human beings as creatures, and natural resources as creatures. The first and second basic elements, namely the relationship between man (slave) and Allah (creator), are in a vertical (vertical) relationship (Mohd Zulkifli, 2020). The function of man as a caliph and servant is to surrender and obey Allah SWT's commands, which is explained by the human element as a creature. In contrast, the element of natural resources as a creature is when Allah SWT has created natural resources for use and human convenience. Natural resources are a tool that humans use to carry out their duties as servants and caliphs who obey Allah SWT (Mohd Shukri Hanapi, 2013). As a result, humans must make the most of these resources while avoiding going overboard.

The Qur'an, Hadith, Ijma (agreement between jurists), and Ijtihad (analogy and creative reinterpretation of legal issues) have been established as sources of reference in the Islamic era, which began in the 7th century (Aan Jaelani, 2018). Islamic economics is a term that refers to Islamic commercial law based on Islamic Sharia law (Al Harethi & Salem, 2019). The application of Islamic values to the Muslim community's economy is crucial, as it serves as a guide to success in this world and the next and gains the pleasure of Allah SWT. The difference between the conventional economic tasawur and the Islamic economic tasawur is that the conventional economic tasawur is based solely on conventional tasawur and epistemology. In contrast, the Islamic economic tasawur is based on Islamic tasawur and epistemology, including the Qur'an, Hadith, ijma, and qiyas (Mohd Shukri Hanapi, 2014). As a result, the application of economics based on conventional economic philosophy will produce conventional economic concepts and theories. In contrast, the application of Islamic economic philosophy-based economics will produce Islamic economic concepts and theories.

As a result of this mixing, the Islamic economy is still linked to the conventional economy and thus not classified as a true Islamic economy. Moreover, mainstream Islamic economists who are influenced by Western values of neglect or Eurocentrism argue that conventional economic theories can be used as long as they are not incompatible with Islamic beliefs and sharia (Mohd Shukri Hanapi, 2014). Moreover, Islamic economics assumptions are said to be inconsistent with the genuine concept of Islam because philosophy has not been adopted from the outset. Therefore, this research is crucial to the resolution of the parallelism of Islamic economics theories

based on the Islamic *tasawur*. It is said that Islamic economics assumptions, such as unlimited human needs and scarcity of resources, have been derived from conventional economic theory. Since its nature is a premise, this means that the assumption can still be debated and disputed (Mohd Zaid & Mohammad Taqiuddin, 2018). The use by mainstream Islamic economists of two dominant thought streams is responsible for the assumptions of Islamic economics that are said to be linked to conventional economic theory (Muhammad Syukri Salleh, 2011). These are accommodative-modification and eclectic-methodological thought streams.

Muhammad Syukri Salleh (2011) agrees that Muhammad Abdul Mannan (1984) and Siddiqi (1989) ideas are the catalysts for this kind of thinking. He argues this reasoning because Muhammad Abdul Mannan (1984) adopted an eclectic approach by adopting conventional economic thinking, while Siddiqi (1989) used a method of integration or fusion between ancient neoclassical economics and *fiqh* (neo-classical based on *fiqh*). Moreover, the open nature of the two schools of thought is called accommodative-modification because it accepts neo-classical economics and allows them to be improved to make Islam, while eclectic-methodological thinking allows any thought or philosophy to be incorporated and incorporated into Islamic economics (Mohd Shukri Hanapi, 2014; Mohd Zulkifli, 2020). Moreover, Chapra (2001) and Abdel Rahman Yousri (2002) support both ideas by arguing that Islamic economics can use conventional economic theories as long as they do not contradict the logical structure of Islamic worldview, and argue that Islamic economics as a combination of sharia principles and conventional economics is unique (Mohd Shukri Hanapi, 2017). On the other hand, because of their acceptance of conventional economic philosophy, Mohd Shukri Hanapi (2014) and Muhammad Syukri Salleh (2011) are opposed to the method. This clearly shows that mainstream Islam is changing only in terms of its implementation, while the core of mainstream Islamic economics remains rooted in conventional economic theory (Mohd Haidzir, 2017; Mohd Shukri Hanapi, 2017). As explained in the previous study, this research is necessary to propose an appropriate theory of Islamic economics assumptions.

2.2 The Scarcity of Resources

One of the theories of assumptions in mainstream economics is the scarcity of resources, which is closely linked to the assumption of unlimited human desires. Scarcity exists in many forms, including money, products, and time (Cannon, Goldsmith, & Roux, 2019). Based on the Population Reference Bureau and Kennedy (2001), resource scarcity can be caused by three factors: demand, supply, and structure. First, resource scarcity occurs when there is an increase in demand for certain goods due to the rise in population or increased consumption while supply remains constant. Second, supply-induced scarcity resources occur when raw materials for the production of finished goods are not available due to environmental or political factors. Third, resource scarcity occurs when a segment of the population is limited to only a few items due to conflict or oppression (Rafikov & Akhmetova, 2018).

Moreover, the scarcity of natural resources gives meaning to the concept of efficiency in the sense of maximizing profits in an extremist way (Zubair Hasan, 2020).

Besides, Islam does not completely reject the assumption that resources are scarce because scarcity is a reality in life (Mohd Zaid & Mohammad Taquiuddin, 2018). Furthermore, there is also stated in Qur'an that every human being has guaranteed their future sustenance (Zulfan, 2020). The statement by Zulfan (2020) is also supported by Wahbalbari, Zakaria Bahari, and Norzarina (2015). They have stated that natural resources are vast and unlimited. Access to natural resources is determined by their level of knowledge that grows as they seek and attempt to access them and develops as they learn how to use them, as well as their location, extraction methods, and cost-effectiveness, all of which are determined by continuous learning, research, and action (Zubair Hasan, 2020). Allah SWT has also set the sustenance rate for humans at a certain quality as long as they try to find it. Therefore, there can be no doubt as to the distribution and acquisition of natural resources because they are the provisions of Allah SWT (Mohd Zaid & Mohammad Taquiuddin, 2018).

However, this does not mean that humans can use it indefinitely by failing to follow it properly. The debate on limited natural resources by mainstream economics scholars is synonymous with the assumption that unlimited humans will further strengthen their arguments (Mohd Zulkifli, 2020).

2.3 Unlimited Human Wants

Previous studies on the assumption of unlimited human wants have not been discussed in depth by previous Islamic economic scholars, most of them focusing solely on the assumption of the scarcity of resources. Human wants or desires may be defined as inherent desires and maybe temporarily fulfilled either on their own or in more complex combinations through the use of appropriate goods in appropriate quantities, and desires to satisfy desires that are driven by other activities (Mohd Zulkifli, Hanudin Amin, Dzulkifli Mukhtar, Shah Iskandar, & Noormariana, 2020). In addition, Yan and Spangenberg (2018) argue that wants can be unlimited, changeable, grow along with income, social position, and advertising stimulus, while needs are being continuously analyzed as anthropogenic and essential. Komala (2019) explains the difference between needs and wants from al-Ghazali's point of view: needs are all basic human needs for life, while will or desire is a human will come in every matter.

It is clear from the arguments of Mohd Zulkifli et al. (2020), Komala (2019) and Yan and Spangenberg (2018) that human will is something continuous and will not end because it is instilled or has become part of a human being. It can also be attributed to the human attitude of never being satisfied with the desire for something (Sloman, Garratt, & Guest, 2018) and the onset of this unlimited human wants. The basis of unlimited human wants to be rooted in the will of human lust alone. Human wants to follow desire is a will that is difficult to control because it seems ungrateful to what it has and always feels dissatisfied with. In Islam itself, the importance of prioritizing needs over desires to take care of human *maslaha* (goodness), such as following the *maqasid sharia*, has been emphasized and can at the same time help control lust. The three (3) categories of *maslaha*, which are stressed in *maqasid sharia*, are *daruriyyat* (basic needs), *hajiyyat* (complementary needs), *tahsiniyyat* (luxury). The philosophy of unlimited human will be slightly contradictory to the Islamic ta-

sawur because a good Muslim will keep within the limits of his relationship with Allah the SWT will always try to control his will and lust while at the same time fulfilling his wishes. Therefore, this study is essential for identifying the assumption of unlimited human desires that are compatible with Islamic tasawur economics.

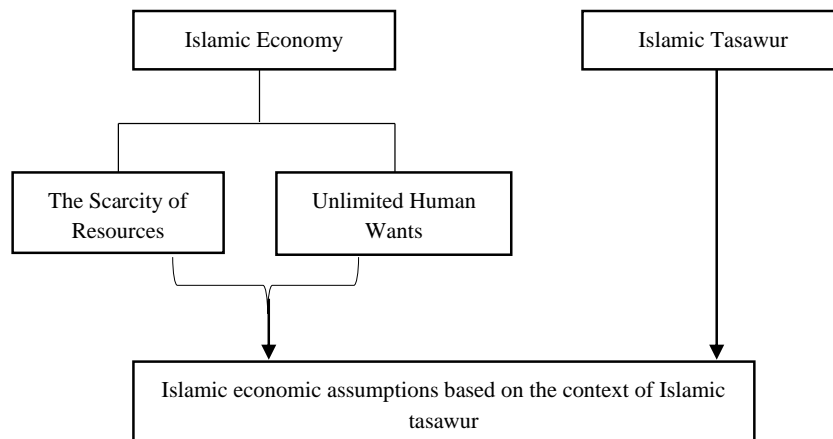


Fig. 1. Conceptual Framework

The conceptual framework of the study is shown in Figure 1. This study identifies the themes of Islamic economics that are the scarcity of resources and unlimited human needs. These assumptions are said to be inconsistent with the Islamic tasawur concept because the philosophy has been adapted from conventional economics. Research on assumptions, therefore, needs to be further studied. A more comprehensive study of economic assumptions is required.

3 Conclusion

The philosophical origins of Islamic economics assumptions are said to have been taken from Western philosophy or conventional economics, which was then Islamized and transformed into Islamic philosophy. In conclusion, the belief that Islamic mainstream economic scholars have a scarcity of resources and unlimited human wants cannot be universally accepted, as it is a little contradictory in the Qur'an. It is important to study these Islamic economic assumptions based on the Qur'an and the Hadith. In addition, it is important to address the Islamic economic assumptions that are consistent with the Islamic tasawur in this research.

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Synchronous Hybrid Classroom in Continuing Education – Tackling Challenges of Exchange and Networking

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Abstract. Digitalization is changing work content, jobs, and processes, making lifelong learning and investment in further education increasingly important. At the same time, it opens new opportunities for providers of continuing education programs by digitalizing teaching/learning settings. In a synchronous hybrid classroom, a video conferencing system enables simultaneous on-site and remote participation. Thus, this format offers potential for continuing education through the freedom to choose from where to participate in the classroom. Continuing education participants are often very busy at work and/or with care obligations and could therefore benefit from local flexibility through remote teaching. However, it is the exchange and networking opportunities that many participants expect from continuing education and which have so far usually been realized through face-to-face interaction. The implementation of synchronous hybrid teaching is associated with several challenges. Beside challenges of technological implementation and the demands on technical and didactical skills of the lecturers, there is a risk that the exchange and networking between participants will suffer. This paper develops key research questions regarding the future design of synchronous hybrid classrooms especially for the target group of continuous education participants. Different methods are presented, with which the necessary evidence could ideally be obtained.

Keywords: Continuing Education; New Learning Formats; Exchange and Networking Opportunities

1 Introduction

The modern (working) world is complex and characterized by continuous change, uncertainty, and ambiguity. Shaped by digitalization and automation, work content, work structures and activities as well as professions and occupational fields change [1, 2]. Existing knowledge becomes outdated, new competences are required and lifelong learning becomes necessary. To sustain employability, the development of skills is needed [e.g. 3]. Employers and employees therefore regularly invest time and money in continuing education and training activities and are interested in ensuring that participants benefit from them to the maximum.

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The education sector and in particular the continuing education industry has been greatly impacted by the COVID-19 pandemic. Before the COVID-19 pandemic, providers of continuing education in Switzerland relied mainly on face-to-face teaching and very few pursued blended learning or online concepts. Due to the lockdown, educational institutions worldwide were immediately forced to stop face-to-face teaching, including universities in Switzerland. Thus, the pandemic brought a real digitalization push: According to the current continuing education study in Switzerland [4], 85% of the providers surveyed stated that they had adapted their continuing education offerings by digitizing the teaching/learning settings. However, the way in which continuing education was adapted varied widely, from online instruction using video conferencing software to a higher proportion of guided self-study. There is evidence that continuing education participants have different preferences regarding new teaching and learning formats. While some participants are positive about online instruction and increasingly accept virtual instruction, other participants prefer face-to-face instruction [4–6]. For many, face-to-face teaching is still the best way to ensure direct exchange among participants and to promote networking. On the other hand, online and blended learning formats open new possibilities to cooperate and network with even more participants and lecturers – also abroad and outside the organization. The synchronous hybrid setting offers the advantage that it considers the preferences of the different parties, since this form allows participants to choose whether to attend classes on-site or online.

For education in society 5.0, questions therefore arise as to how continuing education should be designed in the future to optimally combine digital possibilities and the different needs of continuing education participants for digital instruction as well as for exchange and networking. It seems fruitful to investigate synchronous hybrid settings in continuing education, because it offers potential to combine both aspects.

In the following, we first shed light on continuing education and the motives of participants in continuing education. Then we present the available evidence on synchronous hybrid teaching. Finally, we discuss whether synchronous hybrid teaching is a useful option for continuing education and outline the open questions that still need to be answered. We end with an outlook on how the research questions could be investigated.

2 Continuing Education

OECD, UNESCO and Eurostat distinguish between three forms of learning: formal education, non-formal education, and informal learning [7]. Continuing education is classified as non-formal education: “Non-formal education includes institutionalized, deliberate education planned by an education provider outside the formal education system. This can include, for example, courses, conferences, seminars, private lessons, or on-the-job training” [8]. At the macroeconomic level, continuing education contributes to the competitiveness of countries and economic development and has a positive effect on society. The private and the public sector benefit from people updating their skills with adequate continuing training programs [9]. Therefore, employer often encourage participation in continuing education and contribute to the costs. In the context of the

changing workplace, life-long learning helps employees to foster their adaptability [e.g. 10]. Under the umbrella term "continuing education" there are many different formats that differ in terms of objectives, duration, and design [11]. Continuing education usually aims to link knowledge with action. The focus is on applying what has been learned and interacting with other participants [12].

The continuing education market in Switzerland is competitive and according to estimates there are around 3,000 continuing education providers in Switzerland [13]. Other providers include small, medium, and large private providers organized on a private-commercial or private-nonprofit basis [4]. Before the COVID-19 pandemic, 90% of continuing education providers in Switzerland focused on face-to-face instruction [14]. About half of them relied on largely "technology-free" face-to-face instruction, while the other half focused on digitally supported face-to-face instruction. Fewer than 10% used blended learning and only 2% of providers offered online instruction. According to a current continuing education study [4], 85% of the providers surveyed stated that they had adapted their continuing education offerings by digitizing the teaching/learning settings. But the way in which continuing education was adapted varied widely, from online instruction using video conferencing software to a higher proportion of guided self-study. However, it seems clear that digitalization efforts in the continuing education industry will be sustained. Over 80% of the surveyed providers also plan to incorporate some or all the adapted digital offerings into their permanent programs [4].

2.1 Continuing Education Participants

For the individual, training courses offer the opportunity to maintain their personal employability or to pursue their self-development [9]. Over the last 10 years, participation in continuing education has increased in Europe and Switzerland is one of the countries with the highest rate of continuing education [15]. For example, 62.5% of the population in Switzerland between the ages of 15 and 75 attended a continuing education program in 2016 [8]. The highest participation rate is shown by persons aged 25 to 34 (76%). Among the older age groups, participation in continuing education decreases and is about 70% for the 35- to 44-year-olds and 68% for the 45- to 54-year-olds. This peak participation rate among the youngest age group is not necessarily observed across countries. In Germany, for example, the participation rates in 2018 were the same among 18- to 34-year-olds and 35- to 49-year-olds, at 57% each [16].

According to a survey by the BFS [8], participants most frequently attended continuing education courses for professional reasons, and only a small proportion attended further education courses purely for non-professional reasons. The main reasons for their participation were "stay up-to-date / maintain knowledge" (89%), "be able to do work better / increase career opportunities" (85%) and "personal interest in the subject" (80%). Slightly more than half of the continuing education activities were sought out because of organizational and technological change in the workplace (57%). Studies that examine reasons for non-participation in continuing education support the assumption that participants only take part if they expect a benefit for the future that is higher

than the costs caused by the continuing education [11]. The main reasons cited are a lack of expectation of benefit as well as time and financial restrictions [17].

There are increasing indications that access to continuing education will have to be more individualized and differentiated in the future to be well received by the target group. Jansen et al. [6] evaluated the conversion to distance learning in the continuing education programs of a Swiss University of Applied Studies. More than 400 current participants took part in addition to program managers and lecturers. The results showed that this target group sees the benefits of online instruction and just over half would like to be able to participate more "remotely" in the future. Therefore, the question arises how continuing education should be designed in the future to optimally combine digital possibilities and the different needs of continuing education participants for digital instruction as well as for exchange and networking. It seems fruitful to investigate synchronous hybrid settings in continuing education, as this form allows participants to choose whether to attend classes on-site or online.

3 Synchronous Hybrid Classroom

In addition to face-to-face interaction and purely virtual interaction, there is a learning environment that combines these two formats. In a synchronous hybrid classroom, one part of the class attends on site and the other part participates virtually at the same time while connected to the same platform. Technical settings such as a platform with a video conferencing system, possibly combined with a chatroom and a synchronous brainstorming tool enables simultaneous on-site and remote participation.

In the literature this teaching format can be found under the designation "blended synchronous" [18] or "synchronous hybrid" [19]. *"The concept of the hybrid virtual classroom comprises one group of learners who participates in the course on campus, and simultaneously other individual learners participate in the course remotely from a location of their own choice by connecting to the same platform"* [20]. Synchronous hybrid teaching must be distinguished from distance learning (purely virtual teaching, synchronous or asynchronous) and blended learning (mix of teaching units in presence and in distance learning, synchronous or asynchronous) [21]. This teaching format is most prevalent internationally in higher education, where providers are faced with increasing student enrollments and simultaneously decreasing budgets [22]. Hybrid synchronous teaching is seen as an alternative to asynchronous online teaching because it offers students the opportunity to interact more and be less isolated [23].

3.1 Benefits for Participants and the Organization

In the context of our networked society where we are interconnected and pursue very different life plans, it is important that education is not dependent on location [24]. The synchronous hybrid learning environment meets the student's need to be able to learn with a high degree of flexibility: they are free to choose from where they take part in the lessons and can thus also save travel time. This choice allows students at all stages of their lives to participate in learning opportunities and the organization can appeal to

a broader base of students [20]. In this respect, a synchronous hybrid classroom enables a more equitable access to knowledge and a more inclusive education [25]. Synchronous hybrid teaching opens possibilities to cooperate even more with universities and lecturers abroad and outside the organization (e.g. a group joins in from abroad). In this way, students benefit from more perspectives, ideas and expertise [26]. This given flexibility also ensures that continuity of instruction can be provided and additionally promotes student retention [24].

3.2 Challenges for Lecturers and Participants

Besides the numerous advantages, the implementation of synchronous hybrid teaching involves several challenges. In addition to technical challenges [e.g. 25], lecturers need technical and didactic skills to handle the system and to design lessons in such a way that the two groups ("on-site" and "remote") have a similar learning experience [20, 27]. This is because lecturers need to engage with two groups at the same time and coordinate and facilitate the exchange between remote and on-site participants [24].

For the "remote" participants who join virtually, there is a risk that they slip into a purely observational role, as they have insufficient understanding of the voices in the room and therefore (can) participate little in the discussion. In turn, it can be awkward for "on-site" participants and interrupt their flow of conversation if they must watch the camera and microphone to say something [25, 28]. Because non-verbal cues are very limited in this setting, it is difficult for participants to know when to speak [29]. In addition, there is evidence that student engagement in a purely online setting is highly variable [6, 24]. Another study showed that remote students reported significantly lower levels of relatedness than their on-campus counterparts in synchronous hybrid settings [23]. These two challenges are important in the context of the self-determination theory [30] and the social presence theory [31], which state that interaction and networking among students is central to their learning success. When the need for social interaction is not fulfilled, students become disengaged, leading to declines in motivation and learning success [32].

4 Format for the Future? Synchronous Hybrid Classroom in Continuing Education

As mentioned in the previous section, synchronous hybrid teaching has been used mainly in higher education and, to our knowledge, there are no studies in the context of continuing education. Following a recent literature review, Raes et al. [19] conclude that only a few studies are available on this variant of hybrid teaching. The 47 studies they included point to the advantage of local flexibility but also highlight the associated technical and didactic difficulties [25, 28]. Research and practice on synchronous hybrid teaching are still in its infancy. Since so far mainly exploratory and qualitative studies are available that have primarily focused on organizational implementation and technological design. Good microphone/streaming technology is a prerequisite for synchronous hybrid teaching, but even the best system does not ensure that participants

will benefit from teaching in this setting. There is still the question of how to promote exchange and networking in this setting and how to design synchronous hybrid instruction so that it leads to good quality learning experiences. After all, it is precisely the exchange and networking opportunities that continuing education participants expect from a continuing education program. Research is needed that examines the different scenarios and their consequences on students' learning experiences. Furthermore, existing studies are concerned with the context of training of lecturers and do not shed light on the requirements of the target group of continuing education participants. We can use these unresolved issues to formulate a more specific research agenda for future studies examining the potential of synchronous hybrid learning in continuing education.

4.1 Intention No. 1: Focus on the Needs of the Participants in the Synchronous Hybrid Classroom

The needs and expectations of participants in continuing education have changed. They increasingly want to decide for themselves for which parts of their training they want to take part on-site face-to-face and for which parts they want to take part virtually [4]. This choice appears to be a particular advantage for the target groups of continuing education programs: These individuals often consciously opt for continuing education with face-to-face instruction rather than pure distance learning, as they are interested in more than simply acquiring knowledge and want to exchange ideas and network with others [11, 33, 34]. Face-to-face classes offer ideal conditions for this, as participants can exchange ideas informally during the common coffee and lunch breaks, in addition to the planned exchange in small groups or in plenary sessions. This exchange with other participants is central to informal learning [35]. At the same time, however, this target group is often very busy at work and/or with care obligations, and classroom instruction with compulsory attendance on site presents them with major organizational challenges. By offering flexible learning paths, continuous education providers can respond to the changing needs of their customers. In the context of the increasing relevance of lifelong learning, synchronous hybrid teaching also lends itself to continuous education [19, 20]. To find out what the participants' real needs are and to be able to assess the potential of this format for continuing education, research is needed on how (potential) participants in continuing education evaluate this format and how exchange and networking between participants can best be promoted. The question that comes up is: *How do (potential) participants in continuing education rate different scenarios of synchronous hybrid teaching depending on the concrete implementation and compared to teaching in a purely face-to-face or online format?*

4.2 Intention No. 2: Focus on Creating Opportunities for Networking and Exchange in the Synchronous Hybrid Classroom

Previously, several challenges of the participants in synchronous hybrid settings have been outlined (interruption in the flow of conversation, inactive remote participants, limited non-verbal cues, different levels of relatedness). These findings indicate that the learning experience might be different for on-site and remote participants. In

addition, it became clear that interaction and networking among participants of continuing education is crucial – for their learning success, but also because these two dimensions are expected by the participants and are therefore both expectation and motivation for participation in continuing education.

A way to address the challenge of interruption in the flow of conversation and inactive remote participants is to promote active learning through group work [18]. In the synchronous hybrid setting, break out rooms of virtual video conferencing tools can be used for that matter. In addition, you could look at the influence of mixed group work, e.g. if one deliberately mixes remote and on-site participants. Existing research [23] gives an indication that students who participate remotely in synchronous hybrid classes feel less related than students who participate on-site. To address this, you could look at the influence it has when it is not always the same people in one group, e.g. when participants can choose each time whether they participate remotely or on-site. Finally, it became clear that it is a great challenge for lecturers to design and moderate lessons in a synchronous hybrid setting because of the two groups. We assume that the group size therefore has an influence on the success of the lessons and thus also on the exchange possibilities. A relevant question that arises regarding sharing and networking opportunities in the synchronous hybrid setting is: *What influence does the design of group work have on the individual evaluation of exchange and networking opportunities? What impact do different aspects of group work have on individual perception of sharing and networking opportunities?* Furthermore, it would be important to find out what impact it has on the satisfaction with exchange and networking opportunities if the participants can freely and/or spontaneously decide whether they participate on-site or remotely for each day of instruction. Is it important for participants' rating of the exchange opportunities that there is a fixed proportion of the on-site group? (e.g. 1/3 of the class should always be on-site). Does this have an influence on the motivation of the participants? In addition, it seems fruitful to find out more about the impact of the group size in general on these topics.

We outlined two relevant focal points that should be considered in future studies on the potential of synchronous hybrid classroom for the target group of continuing education participants. In the following part we explore for this purpose new directions of research.

5 Exploring new Directions for Research

Various approaches appear to be useful to investigate the research questions identified. In the following we address the methods formative and summative evaluation, field experiment and the factorial survey.

5.1 Formative and Summative Evaluation

To investigate the learning experiences of continuing education participants in synchronous hybrid classrooms, continuing education programs that already implement synchronous hybrid teaching could be examined. In a formative and summative evaluation [36, 37], participants and instructors are asked about different criteria. Thus,

participants would receive a questionnaire after each session of the program or at the end of the program to assess their learning experience and rate the possibilities for exchange with other participants and the lecturer, the possibilities for networking and other variables such as distraction, goal achievement and satisfaction. Information on the specific design of the setting is obtained from the instructor. Program evaluations are carried out regularly by many training providers to ensure quality [38] and should therefore be able to be supplemented by additional questions on the experience of the synchronous hybrid setting.

Through a survey after the sessions, information is obtained about how participants experienced the synchronous hybrid setting. Their evaluation depends on the specific implementation in the program, e.g. what technology was used, how was group work organized, what is the instructor's experience with this teaching format. When comparing different courses that all use synchronous hybrid classrooms, it is difficult to identify the factors that have the greatest impact on participants' learning experience and perceived exchange and networking opportunities. For example, it is difficult to determine whether choice (remote or on-site) or size of the respective groups are determining factors.

5.2 Field Experiment

A field experiment in a real-world setting offers the possibility to systematically vary different factors [39]. They are characterized by a high degree of realism of the situation and thus a high external validity. In return, one must accept limitations regarding internal validity: confounding variables cannot be controlled or only with difficulty. A field example could be used to find out what minimum group size is necessary on-site to meet the needs of the participants. Furthermore, one could vary whether participants in a multi-day program can decide spontaneously whether they want to participate on-site or remotely, or whether they must decide at the beginning of the entire program. Thus, instructors of continuing education programs could all receive the same training on how best to implement the synchronous hybrid setting (for example technical aspects, design of group work) to control for disturbance variables. Selected variables would then be manipulated. However, randomized assignment of participants to on-site and remote groups would not be feasible, since the training participants are paying customers who therefore cannot be forced into a group.

5.3 Video Vignettes in a Factorial Survey

Since many continuing education participants have not yet had the opportunity to gain their own experience with a synchronous hybrid classroom, a factorial survey with video material can be a suitable way to find out how they evaluate different scenarios of this format. This research method combines the advantages of the classical experiment with the advantages of a questionnaire survey [40]. In a standardized survey, the influence of characteristics of e.g. situations on people's perceptions and judgments is elicited [41, 42]. Short descriptions of a fictitious situation (vignettes) are presented to the respondents that differ systematically in the characteristics to be investigated.

These descriptions are not presented as descriptions, but as short videos, each showing a concrete teaching situation. Regarding the synchronous hybrid classroom, this means that the setting presented is systematically varied. Thus, the participants of the study receive video examples in which it is illustrated as if they participate "remotely" or "on-site" in class. Furthermore, in these videos it can be varied, for example, how the exchange between the participants and the lecturer works and how large the group of remote or on-site students is. Respondents can be randomly assigned to the "on-site" or "remote" situation and a comparison with pure face-to-face and online instruction is possible. Thus, data can be obtained based on which evidence-based recommendations can be made without having to burden paying continuing education clients with an experimental setting.

All three approaches can be ideally complemented to explore the research questions related to synchronous hybrid settings. A factorial survey could be used to determine the needs and fears of continuous education customers regarding the implementation of this setting. In a quasi-experimental field experiment, the variables that proved to be crucial could then be manipulated and their effect on e.g. participant satisfaction with the exchange possibilities could be measured. Finally, the implementation in continuing education programs should be accompanied by a formative and summative evaluation to gather further insights regarding the teaching format.

6 Conclusion

Increasing digitalization has created new opportunities in the continuous education market that interact with the needs of the heterogenous group of potential continuous education customers. The synchronous hybrid format, for example, offers participants freedom of choice with the ability to attend courses either on-site or remotely. So far, however, little is known about how this setting is ideally implemented and which technological and didactic skills the lecturers need so that the goals of continuing education participants regarding exchange and networking can be achieved. For providers to take advantage of this potential, evidence is needed regarding the specific needs of participants in terms of their learning experience and in particular their exchange and networking opportunities. This should be gathered through factorial surveys, field experiments and formative and summative evaluations. With this evidence, concrete design recommendations for synchronous hybrid settings can be derived. These design recommendations are also valuable for companies for their implementation of meetings and internal training courses.

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Towards Context-Oriented Process Modelling in the Circular Economy

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Abstract. In the linear economy model, Lean Management and Process Excellence were initially developed in the automotive industry but they were slowly adapted by service industries, such as banks or insurance companies to optimize their own Business Processes (BP). When optimizing BP, models are created and BPMN (Business Process Modelling Notation) serves as a standard notation to design and optimize BP with the help of well-known KPIs (Key Performance Indicators). However, the recent trend of considering the circular economy in an organization's optimization initiatives has resulted in increasing pressure to put additional focus on environmental-friendly production processes.

Consequently, business process models today should not only be optimized according to the principles of process excellence but also put more emphasis on design as a part of circular economy (CE) to gain environmental excellence. Thus, BPMN models need to become more context aware. The objective of this exploratory paper proposes varying ways to incorporate well-known aspects of CE into the methods, models and tools of Business Process Management in order to move towards a Context-Oriented Process Modelling in the Circular Economy. The aim is to contribute to the discussion on how additional measures from environmental, economic and financial incentives could generate an impact on how products and services should be designed in a human-centered and environmentally friendly Society 5.0.

Keywords: Circular Economy, Business Processes, BPMN, Recycling, Refurbishing, Sustainability, Financial Incentives, Key Drivers

1 Introduction

During the Third Industrial Revolution, the automation of processes in the manufacturing industries was heavily influenced by the Japanese car manufacturers. Additionally, the breakthrough of Business Process Management (BPM) was initiated by Ford Motor Company's observations that Mazda's purchasing process was about three times more efficient than its own process. In the Fourth Industrial Revolution, the

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focus is on further process improvements with the help of Internet of Things (IoT), and the idea to generate more insights for improvement by creating a Data-Information-Knowledge cycle. In contrast to Industry 4.0, Society 5.0 shifts its focus on the impact of technology on the public and the aim and need to create a better society (Society, 2020).

However, a human-centered society will not happen without taking Sustainable Development Goals (SDG) into account, which the U.N. agreed to in 2015. In the United Nations Environment Programme 2019.3 (UNEP, 2019), sustainable consumption, production and resource efficiency are mentioned as key elements for achieving the 2030 Agenda. Besides enabling policies on the environment and a sustainable lifestyle, sustainability in businesses is one of the key focus areas of the Resource Efficiency sub-programme, which is divided in five different indicators. Amongst these, “increasing the number of public and private finance stakeholders that adopt sustainable finance principles, processes and frameworks” and “increase in the number of companies that report sustainable management practices they have adopted” are mentioned. But can we actually measure the facts and figures in order to show progress?

Given the fact that the Fourth Industrial Revolution preserves the basic principles and best practices of the Third Revolution in terms of BPM, and also adds the insights from IoT to build an additional context of data and knowledge to the production process, SDG could serve as additional context for Society 5.0 by adding aspects of the circular economy to BPM. The importance of context-orientation of BPM is well recognized and numerous methods to incorporate the different process dimensions (e.g. value contribution, knowledge intensity, creativity etc.), organization dimensions (e.g. industry, size, culture, resources etc.) as well as environmental dimensions (e.g. competitiveness, uncertainty) into account (vom Brocke et al., 2021). However, the processes management of the linear economy models should be turned into circular process thinking and the ideas of lean management of processes should be enriched with clean management objectives including, once again, a move towards a Context-Oriented Process Modelling in the Circular Economy.

2 What is the Circular Economy?

2.1 Background

The current linear economy where resources are extracted, shaped into products, sold to consumers, and then simply wasted at the end of their life cycle is undisputedly behind the record levels of pollution such as discarded plastics, microplastics, e-waste, apparel, etc. in the environment. This same linear economy is also responsible for the pressure on renewable energy flows that are reaching the breaking point. Additionally, the linear economy model has caused a tripling of the global extraction of materials between 1970 to 2017 (Oberle et al., 2019).

Consequently, this is undeniably posing a major global risk, not only because of ever increasing resource scarcity, but also because 90% of our biodiversity loss and water

stress has been directly linked to material extraction. Hence, a new model of production is clearly required to help halt environmental degradation and excessive material loss caused by the linear economy's "take-make-consume-waste" processes. The goal of circular economy principles of production is to mimic nature where everything is available in abundance and nothing is wasted. In the future, there will be two material streams: metals that are kept in circulation as long as possible; and biomaterials that can biodegrade and become a resource for new products. The circular economy will also rely on renewable energy and additionally be free of toxins (Ellen MacArthur Foundation, 2013).

The outline below, designed by the Ellen MacArthur Foundation, illustrates this flow of two different materials, namely Renewables and Finite materials:

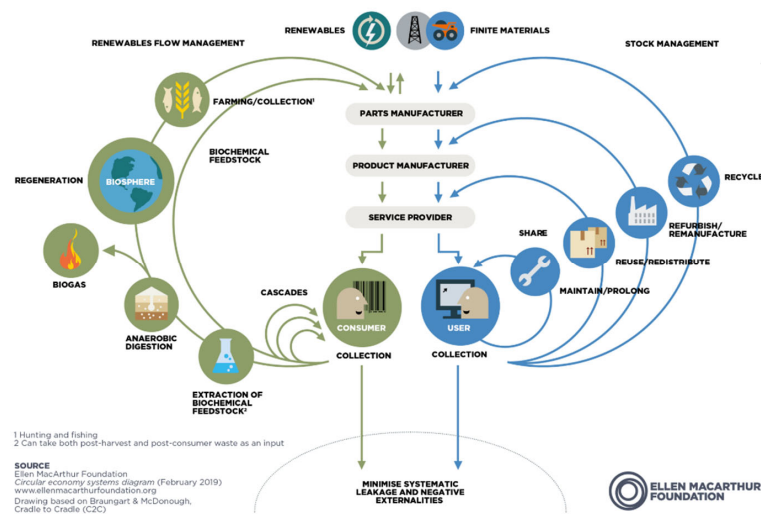


Fig. 1. Outline of the Circular Economy

Source: Ellen MacArthur Foundation

Aligned with this Outline of the Circular Economy are three principles:

- Principle 1: Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows.
- Principle 2: Optimize resource yields by circulating products, components, and materials, at the highest utility at all times, in both technical and biological cycles.
- Principle 3: Foster system effectiveness by revealing and designing out negative externalities.

At the core of Principle 2, is the design for remanufacturing, refurbishing, and recycling in order to keep materials in circulation. What is meant by "to design for

remanufacturing, refurbishing and recycling” for companies? Simply put, a new modelling is required to design out waste. And waste analysis needs to be incorporated into our current business models, as well as, our current business process models for organizations.

2.2 Design Out Waste

The first person to introduce the Cradle-to-Cradle concept was Walter Stahel, who is considered by many as the “father” of the circular economy (Stahel, 2010). This term gained worldwide traction when William McDonough and Michael Braungart published a book with the same title, *Cradle to Cradle: Remaking the Way We Make Things*. Their fundamental premise is that – like in nature – waste is reused and in effect ultimately becomes nutrients for subsequent growth (Baumgart & McDonough, 2009).

As the world is increasingly still being covered in waste, to reach this level of alignment with nature, a totally different approach to products and services is clearly required. The primary responsibility lies in the design phase because once a product specification is decided, it enters the production phase and then afterwards only minor changes become possible (Nasr, 2016). Decisions made at the design phase influences 75% of the products economic cost and 75% of its social and environmental impacts.

Not surprisingly then, design has gained an important role in rethinking the production process, but this new requirement must consider not only designing products that are going to have another life cycle but to also design out waste completely. This requires a momentous shift in thinking about immediate product form and functionality to the product’s ultimate long-term value to the customer. In the circular economy, the “why” behind purchasing a product will have to play a key role in design. In a human-centered society, this will mean that products ought to be designed for consumer attachment and trust or emotional durability.

In the following chapter, we will elaborate about how this new development influences the production process and more specifically why a move towards a Context-Oriented Process Modelling that considers the CE will become increasingly essential.

3 Business Models and Business Process Modelling for Circular Economies

Reshaping industry and revamping existing organizations will also necessarily result in the need to adjust the models that we use to describe them. The purpose of models can either be descriptive or prescriptive. Descriptive models can be used to visualize an existing artefact and prescriptive models can be used as design blueprints to describe this object to be built. Models can also be used at different abstraction levels. Current models of the circular economy, such as those from the EMF (Ellen MacArthur Foundation, 2013), are mostly of a prescriptive character and are described from a very high abstraction level. In effect, they are graphical semantic representations rather than models with a defined syntax of different drawing elements. Yet, some models do describe the CE from the system dynamics approach, which can prescribe the effects

of remanufacturing, analyze sensitivities of the different input parameters or plot essential system parameters such as transportation cost, energy consumption, or any other KPI of interest over time, such as the model of a Reverse Supply Chain by A. Brissaud (Alamerew & Brissaud, 2020).

Nevertheless, standardized business process models or business process landscapes, which are often used to describe the process architectures of circular economies are rarely be found in the BPM literature. Process redesigns and process improvements related to aspects of lean thinking during the Third Industrial Revolution are mainly focused on the qualitative and quantitative analysis of value adding, business value adding and non-value adding activities (VA, BVA, NVA) within the business processes and targeted towards the elimination of waste, such as the well-known seven Mudras (transportation, inventory, motion, waiting, over processing, overproduction, and defects).

With respect to a data-driven and event-based approach of Industry 4.0, event-driven information system architectures such as the Line Information Systems Architecture (LISA) have been proposed (Theorin et al., 2017) and describe the processes from a perspective of functional hierarchies of processes from a Level 5 (company management) down to Level 0 (the actual production process). However, as yet, no comparative approaches exist which incorporate aspects of CE to the BP modelling.

3.1 Current Business Models and Process Landscapes

When addressing business process management within organizations, process landscapes serve as the first entry to grasp the Level 5 or Level 4 process architecture. Most BPM tools support to draw abstract models with these typical process shapes, while some of the tools even provide the possibility to draw organizational charts and link them with control objectives or performance indicators.

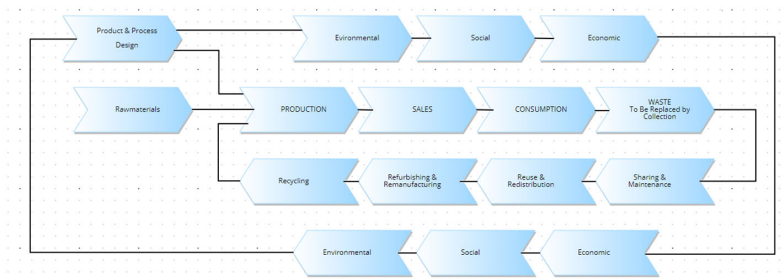


Fig. 2. Process Landscape for Circular Economies

Most products today are still designed for a single use purpose and become, at the end of their life cycle, a waste product where the process landscape only contains the process chains of raw materials – PRODUCTION – SALES – CONSUMPTION - WASTE, as depicted in the second row of the process landscape in Figure 2. While the product and process elements of the production have been improved and optimized, the

goal has been on resource efficiency as raw resources are a major cost factor in the production. And the process of Collection, which is the entry point of the CE, is not taken into account.

After a company has produced a product, the Sales Department's primary effort is to convince customers to purchase as many as possible of these goods. The next goal related to the products' consumption – from the producer's standpoint – is to ensure that the products last a very limited period of time in order to bring the consumer back to the Sales Department. The role of the optimization has been to create a perfect process for a product but, in practice, this process should not be too perfect! If too perfect, the product will not be wasted and would not open the door to a new purchases as increased sales remains a key element of the old, linear process model. This approach led to planned obsolescence. *“Most products are designed for a single life cycle and then discarded.”* (Nasr, 2016). In the new circular economy model, design carries with it far more responsibility. Indeed, it is at the very center of decision making because design will determine the length of the lifecycle and the path of the product at the end of its life. In the linear model, in effect, waste was never even considered.

The circular economy is also shifting the focus from the quantity of products sold to the core value of the product itself. For example, the rise of the sharing economy where a product is fundamentally a service that offers customers the functionality and value of the product, but these considerations need not be aligned with the actual ownership of the product. A new generation of the consumers is primarily interested in the benefit of the product but without ownership. At the same time, this development is creating an additional incentive for producers to manufacture durable products because companies can also be paid for the service and usage of the product and, consequently, are no longer under urgent pressure to replace it with a new product. This same premise obviously is valid for the Three Rs (Reuse, Repair and Recycle).

As the following graphs illustrate, when design is at the center of the production process, the former equilibrium of the linear economy shifts.

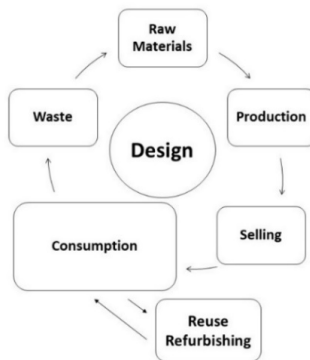


Fig. 3. The Circular Flow for Reuse and Repair with the Design at its Core

In the Reuse element above, the increased lifecycle of the product requires higher quality criteria and standards as products are resold and enter their second (or even third) lifecycle. Due to reusing products, there is significant less need for new raw materials which – in the end – leads obviously to less waste.

The same Refurbishing element, “Right to Repair” is one of the corner pieces of the new European Green Deal (European Commission, 2019). The Repair concept adds similar challenges to the production and the quality expectations as with the Reuse model. The core difference is that the product remains with the same ownership, but the lifecycle of the product gets extended. The third option is the Recycling solution. Again, when design is at the center of the production process, the decision as to what happens with the product at the end of the lifecycle is actually decided during the design phase. This process will ultimately eliminate landfills, incinerators, and the illegal trade of waste.

However, this model requires a few additional steps before the products can be returned fully to be used as raw materials once again. These include the separation process conducted by consumers, professional collection options and waste separation that is then prepared for recycling.

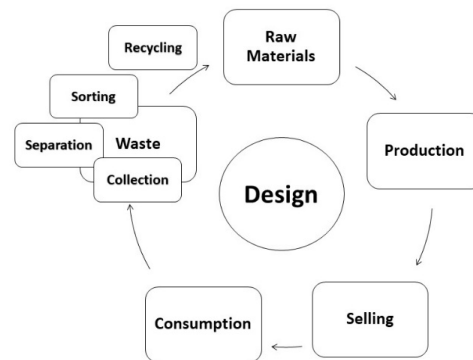


Fig. 4. The Circular Flow for Recycling

Considering all of the required changes to the production process, how can a company adjust its processes to meet these emerging market demands?

3.2 Improving Existing Process Models

The International Organization for Standards provides and develops standardized frameworks and principles which help to implement SDGs, where the ISO 14000 family is dedicated to support organizations to minimize the negative effects of their

operational processes on the environment. The well-known Plan-Do-Check-Act (PDCA) cycle, mentioned in ISO14001, points out the important aspects of a continuous process improvement. However, not all of the processes that are implemented in organizations will have an impact on the global SDGs and also on the traditional assessments of the process portfolio where the processes can be listed on a two-dimensional pick-chart in order to determine, which of the processes should be focused on first to generate the highest possible return on investment.

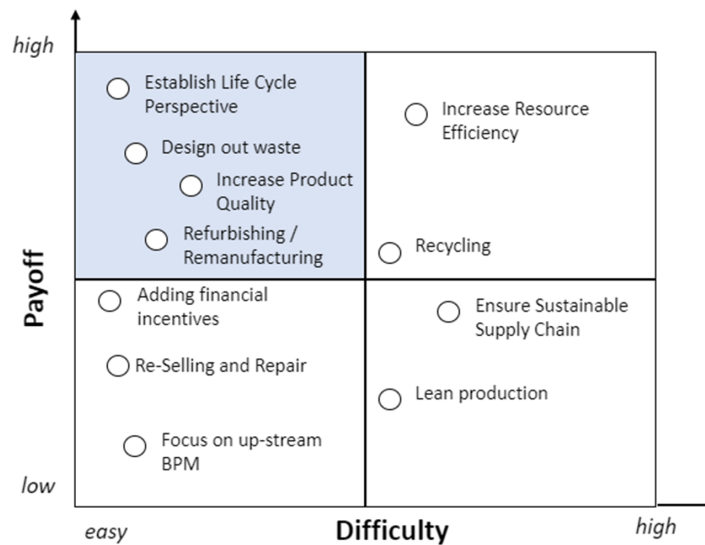


Fig. 5. Pick-charts to Prioritize the Processes Candidates for CE Improvements

Figure 5 shows some examples of process candidates. The processes on the upper left corner should be picked first, since they are easier to implement and the impact, which could be generated in terms improving the KPIs of CE, is at the highest. The processes could be taken from the different abstraction levels. The lower the level, the more detailed the process needs to be described.

Once the candidates for improvements are identified, the processes are analyzed and modelled at the appropriate level of detail with the help of the standardized Business Process Modelling Notation (BPMN 2.0). In many cases, they might still be on a high abstraction level such as those from the process landscape in Figure 2. However, when talking about manufacturing processes in a circular economy, circular visualizations such as those in Figure 3 and Figure 4 should be taken into account. With current tools, traditional linear landscapes can easily be modelled in the typical traditional up-stream and down-stream thinking models. Workarounds to build circular models such as illustrated in Figure 2 are possible, but not as yet satisfactory.

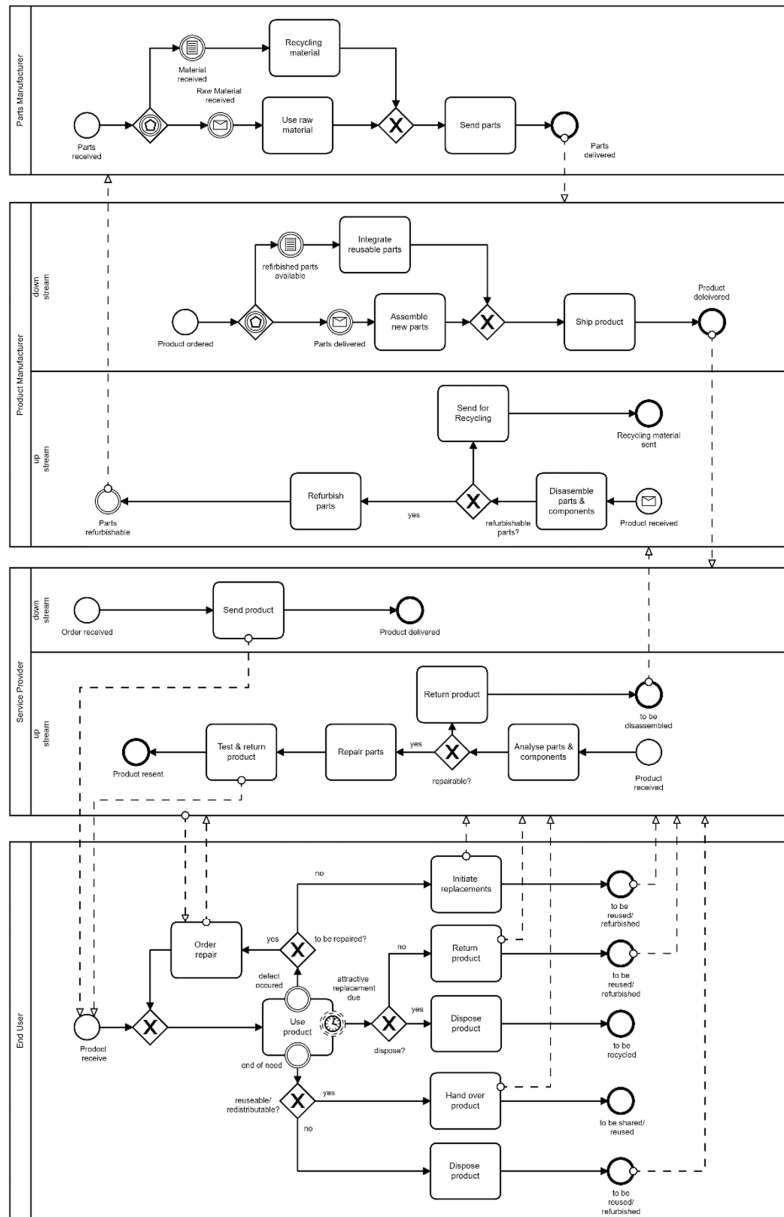


Fig. 6. Detailed BPMN models including up-stream processes from CE

Also, when diving deeper on the BPMN level to describe operational processes, there are certain difficulties to mimic circular processes. Given the scenario of any typical production process, which should be redesigned according to the principles of collecting, reusing and refurbishing or recycled raw materials, the material flow cannot be well be expressed with the current layout possibilities, as seen in Figure 6.

Such process models could be used to analyze the activities in place and are capable to point out some aspects for re-design. However, the possibilities of this low-level process modelling currently also has some shortcomings with respect to the expressiveness of the model, as previously noted in terms of a circular layout of high-level process landscapes. At lower levels, BPMN 2.0 currently only provides two types of flow: the dashed arrow represents information flow; and the arrow with the solid line represents sequence flows. Yet, there is the possibility to add information objects as input or output of activities, as there is currently no syntax for the representation of material flow!

Nonetheless, new process models should incorporate the idea from turning the “take-make-consume-waste” pattern of many of our current goods into a service-based scenario. In the linear economy era, the end-users must decide whether a broken product should be repaired or thrown away. Due to high service costs, they will likely throw the product away or perhaps return it to the store they bought it. In the circular model, this decision should be assigned to the service provider, who in turn can further delegate decisions to the product manufacturer. So, ultimately, the likelihood of refurbishing parts will be more likely increased. Unfortunately, this development is often associated with increased initial costs for the manufacturer. So, why would a company change? Which incentives could motivate the manufacturer to incorporate this new circular model?

4 Driving Forces and Factors

A main driving force for any change within the company is considering consumer preferences, and clearly these days there is evidence that indicates consumers are ready and willing to contribute to a more sustainable world. Additionally, governments are adjusting their rules and regulations to meet these sustainability demands. It is also increasingly beneficial for companies to go green as it has been shown that enterprises that comply with environmental standards have higher profits (Yao & Yang, 2012). Yet, despite this evidence and the enforcing framework, how can companies finance their transition?

The major factor behind all business development is, without any doubt, the access to capital. However, the recent transition to the circular economy has caught financial institutions flatfooted and unprepared. One of the reasons for this is that financial institutions are under pressure to comply with the ESG criteria which have an environmental aspect within but do not as yet require a transition to the circular economy. Hence, the circular economy is still largely underrepresented within the financial industry.

As Yunyan & Biao (2014) rightfully argue, to accomplish resource reduction, companies must depend on large-scale production to reach economies of scale. Committing to only a small circular change does not help the company, nor the environment, and a complete transition is associated with high investments. When recycled parts are added to the original raw materials, this changes the requirements for the entire production process, starting with the machines. Cost reduction of the original input prices can thus create a compelling incentive for change.

The authors have highlighted several ways, financial institutions can support this transition “...*declining interest rate, extending the credit period, increasing the loan amount and relaxing repayment condition...*”(Yunyan & Biao, 2014) as incentives for companies to manage the transition to the circular economy. When these conditions apply for a whole industry, healthy competition can support a drive towards the circular economy. Plus, it would naturally also include enterprises along the whole value chain, causing positive cascading effects.

Stahel proposed over twenty years ago that governments need to create a legal framework for change to take root, like the taxing of non-renewable resources. He admits that he “...*underestimated the inertia of public policy making...*” (Stahel, 2013). Nonetheless, increased raw material prices ought to force companies to look for alternatives.

Considering that the market offers a variety of other positive effects for companies that are producing circular products such as enhanced brand strength and attracting new customers, an adjustment to BPMN that enables Context-Oriented Process Modelling in the CE becomes increasingly essential.

5 Conclusion

In order to reach the SDGs on a global scale, the pressure to transform the linear economy into a circular one is very both critical and increasingly more urgent. Incorporating the possibility to enable the modelling community to share their thoughts about optimal process architectures on Level 5 or Level 4, as well as, creating best practice process models which are easily shareable through standardized BPMN models at the lower levels could be essential in sharing best practices and reaching the SDGs as fast as possible. From an historical perspective, the idea of lean manufacturing had a strong influence on how business processes were analyzed.

Today, as mentioned at the outset, principles which were originally conceived on the production lines of the automobile industry are now as commonly used in financial and service industries, where Business Process Management has been implemented and processes can now be modelled with the help of many varying tools. High level models such as process landscapes, but also low-level models, could be modelled with BPMN or even automated with the help of workflow engines to orchestrate processes across service providers, product, or part manufacturers.

However, when moving to such scenarios, the implementation suggestions of the circular economy which are currently envisioned and described with the help of non-

standardized graphical pictures such as those in Figure 1, are neither reusable models nor yet supported by the BPM tool providers.

Firstly, the circular layout of processes is not an option, and secondly and even more challenging, is the representation of material flows. BPMN currently supports message and sequence flows, but no material flows, which are intrinsically important in circular processes. Current investigations in CE are on the agenda of many manufacturing companies and accompanying financial incentives will add additional pressure to optimize processes in the manufacturing industries and, in the long run, ultimately design out waste. Given the need of SDGs and the financial incentives for enterprises to implement not only lean, but also clean thinking, the time has come where these very same manufacturing industries could profit from all the tools and methods of BPM which the service industry developed by incorporating lean thinking.

We have, and share, the hope, that a model-driven process adopted by the finance and service industry and transition to a comparable, context-oriented process modelling that incorporates CE objectives and thus circulate back enabling manufacturing industries to finally implement urgently needed lean and clean circular processes.

6 Limitations

This paper has several limitations and partially raises question without providing specific solutions. This paper is an invitation to evaluate BPMN in the context of circular economy principles. It is pointing out the need of additional views and shapes in modeling tools to improve the ability to model circular economies, circularity in process landscapes, circular processes and material flows. Future conversations with companies will deliver additional insights and help the authors better understand challenges of such a transformative transition. Additional publications will be necessary to shed more light into specific suggestions or potential enhancements of BPMN to support the transition to the circular economy.

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Sustainability Orientation in Business Models of Swiss Start-ups

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Abstract. Research on Sustainable Business Models of start-ups currently focuses on those which pursue a sustainability goal as a main aspect and at least also follow an ethical motivation, possibly in addition to the profit motive. This paper aims to firstly identify useful criteria for describing sustainability in business models and secondly does an investigation on the sustainability orientation and implementation in business models of participating start-ups in the Swiss Innovation Challenge, a business plan competition. As sustainability was no criterion in the application process, many of the start-ups didn't have a strong sustainability orientation. It will be examined to what extent these start-ups take sustainability aspects into account, and which ones in detail. Secondly, it is examined which business model types are used here in order to identify prevailing types and patterns for start-ups that are not selected for their sustainability orientation. The 25 start-up teams were interviewed with a semi-structured interview guide, including an evaluation of sustainability criteria. Almost all start-ups have a strong profit orientation and many also consider sustainability in their business model, though mostly with only one field of action. The linear business model is dominant and only few start-ups contribute to the circular economy. Another outcome of the survey is that the sustainable business model patterns should be adapted for this target group of start-ups not geared towards sustainability for future research.

Keywords: Sustainable Business Model, Circular Economy, Sustainable Entrepreneurship.

1 Introduction

As the impact of human activity on our planet becomes ever more threatening, it is becoming more necessary to incorporate sustainability not just incidentally, but comprehensively into our actions. Businesses play a major role here as they are important players in economic activity, both in terms of resource consumption and in terms of how we interact with each other. Thus, companies have a direct influence on the way humans live today and in the future. The traditionally dominant way of using resources to produce products and services and throwing them away after use is being challenged with new approaches such as the circular economy approach (PwC & WWF, 2021). Sustainable business is essential to keep our planet livable for future generations. The definition of sustainability published by the so called Brundtland Commission as early

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as 1987, although general, is still catchy and accurate: "Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs." (World Commission on Environment and Development, 1987, p. 6). In this same Brundtland Report, companies are also held accountable, along with individuals, governments and other institutions (World Commission on Environment and Development, 1987).

Start-ups can make a contribution here - they have the opportunity to incorporate sustainability aspects into the business model from the very beginning. According to a study by the European Commission, 80% of the environmental impact is already determined in the design phase of a new product (European Commission, 2014). On the other hand, start-ups also face the challenge that they cannot yet foresee and manage the entire production cycle in the start-up process. This paper will address the contribution of start-ups that do not have a focus on sustainability. By numbers, this is the vast majority of start-ups. For an overview on the worldwide entrepreneurial activity see the yearly publication of the Global Entrepreneurship Monitor (Bosma et al., 2020).

In 2013, Boons and Lüdeke-Freund (Boons & Lüdeke-Freund, 2013, S. 17) did a systematization of sustainability characteristics and identified a need for further research on the consideration of normative and sustainable aspects in the innovation process of companies. In the publications on sustainability and entrepreneurship of the last twenty years, the focus has generally been on start-ups or innovations in which a sustainability aspect (such as the development of renewable energy or a sharing platform) was the core of or explicitly the business idea, for example in (Schaltegger et al., 2016; Schaltegger & Wagner, 2011). In Boons and Lüdeke-Freund, social and environmental values should also be considered in the value proposition and the supply chain, the consumption and financial model should also be sustainable (Boons & Lüdeke-Freund, 2013). In reality, often only one of the sustainability aspects is considered, and improving sustainability is not always a declared goal of the start-ups (Schaltegger et al., 2018), but one aspect among several. In Stubbs and Cocklin, Sustainable Business Models take into account the benefits for all stakeholders and do not only focus on shareholder value, i.e. ultimately profit (Stubbs & Cocklin, 2008). However, there are strictly profit-oriented companies that (nevertheless?) contribute greatly to sustainability. Where to draw the line between sustainable and non-sustainable startups? A common understanding of a Sustainable Business Model is missing so far (Breuer et al., 2018).

Furthermore, several articles describing possible sustainable business models have been published in recent years. Here, too, authors assume that business models have a clear normative orientation and are generally primarily sustainability-oriented (H Breuer et al., 2018). Even though it is noted that sustainable innovations emerge in different ways and also develop randomly and with little guidance (Ahrend, 2019), the typology of sustainable business models in Ahrend and others assume that business ideas that are sustainability oriented at their core, e.g. in (Lüdeke-Freund et al., 2018). Research on the sustainability orientation and respective business models of start-ups that do not mainly or only randomly selected pursue a sustainability goal is still missing. This article aims to help close these gaps. Start-ups are considered that participated in the business plan competition "Swiss Innovation Challenge" (*Swiss Innovation Challenge*, 2021) and were not selected in this context on the basis of sustainability

orientation. Thus, these are start-ups that might happen to also pursue a sustainability aspect at the core of their business idea. For most participants, however, this is not the case, and sustainability aspects can be found as a secondary aspect, or not at all. The range of consideration of sustainability was wide, and this range will be mapped and examined here.

In this conference paper, the question is, on the one hand, to what extent these start-ups take sustainability aspects into account, and which ones in detail. On the other hand, it examines which business model types are used here in order to identify prevailing types and patterns. The results can help to understand the nature and approach of sustainability considerations for further research and to be able to promote sustainability overall with better support of the entrepreneurs.

Structure of the paper. First, a literature review will be used to conceptualize what criteria can be used to describe sustainability, how categories for business models can be developed, and how these can be assigned to startups. Subsequently, the 25 participants in the competition who were available for an interview on the topic of sustainability will be assessed on the basis of the criteria developed. Finally, the results of the study are evaluated and commented on.

Method. Personal interviews were conducted under the assumptions that firstly participants do not know a lot about sustainability criteria and often did not think about the implementation, and therefore explanations during the interviews are necessary. Secondly, the interviewees will not spend much time to do an assessment. The personal interviews took about one hour. The research procedure was explorative with the knowledge about sustainability contributions still growing. Interviews give the opportunity to flexibly include additional questions.

The interview transcripts were qualitatively analyzed. It is assumed that start-ups fit in categories of sustainability criteria. Business models were categorized by the interviewer (SDG, sectors, degree of sustainability orientation, business model types, ...). Besides the descriptive quality for a single start-up, a simple statistical analysis facilitated the qualitative analysis as further information about the group of start-ups could be gathered and the single start-up could be positioned against the group.

Data collection took place with the registration for the Swiss Innovation Challenge 2020 and with a survey of the participants after the 2nd pitch. Data on sustainability orientation and intensity were collected. The interviewer made a rating on different sustainability topics with an ordinal scale ("does not apply at all" to "fully applies"). In addition, characteristics of the competition participants were collected that describe the business model. (See sections 2 and 3)

The semi-structured interview guide is aimed at the participants of the Swiss Innovation Challenge who were selected by the jury for the 2nd pitch. Both innovations that lead to the founding of a company (start-ups) and innovations in existing companies are incorporated. In the 2020 cohort, all participants who agreed to have the sustainability interviews were start-ups, though. The participants come from all over Switzerland and occasionally from neighboring countries. They are randomly distributed across different industries and business models.

The participants did not know anything about this research project on sustainability aspects prior to registration, which is why the selection at this application level is random. Participation in the interview is voluntary. Participation or refusal seemed to mostly depend on time availability, rather than interest in sustainability issues. A bias towards participants with greater interest cannot be ruled out, though, which is why conclusions for the population cannot be drawn. However, statements can be made about the group of interview participants. The interviewer was thoroughly introduced to the topic and the questions and possible answers were discussed. Since one colleague conducted all 25 interviews, the evaluation is consistent. The evaluation was additionally and independently reviewed by the project management.

2 Sustainable Entrepreneurship

For a later evaluation of the competition participants in terms of sustainability, possible forms of sustainability are first systematically described. It is not the aim to draw a sharp line between sustainable and non-sustainable business models. Because of the many forms of sustainability, this is also not readily possible. Rather, there are various sustainability criteria and these in different forms, so that it is better to create a kind of sustainability profile for each company under consideration. We start with the more general sustainability criteria and then become more specific.

There are numerous definitions of sustainable entrepreneurship. Like all entrepreneurs, sustainable entrepreneurs seek to identify, develop, and market a future business with a product or service - as in any startup or innovation project. In doing so, they take risks that they must manage for long-term success (York & Venkataraman, 2010). The terms entrepreneur and entrepreneurship are used broadly in this article. These are startups directly before, in the process of founding, or in the initial period after founding. Generally, we also include so-called intrapreneurship, i.e., the implementation of new, innovative business ideas in existing companies (Schaltegger & Wagner, 2011) even if we happen to have only start-ups among the interview participants in 2020. Sustainable entrepreneurship is defined in this way:

"We view sustainable entrepreneurship as the discovery, creation, evaluation, and exploitation of opportunities to create future goods and services that is consistent with sustainable development goals." (Pacheco et al., 2010), or:

"An innovative, market-oriented and personality driven form of creating economic and societal value by means of break-through environmentally or socially beneficial market or institutional innovations". (Young & Tilley, 2006)

The first definition is quite general and refers to all corporate activities that are compatible with the Sustainable Development Goals (United Nations, 2016). Incompatibility with any of them is treated as an exclusion criterion. The second definition is on the one hand broad in terms of a general value creation, but on the other hand requires innovations that at least achieve a breakthrough in the environmental or social field and is thus stricter, as sustainability must be recognizable in the core of the business idea.

2.1 Motivation and profit orientation

Following this strong sustainability orientation, one characteristic mentioned in the literature is the motivation of the entrepreneurs. Sustainably oriented start-ups are often assumed to act at least also with ethical motives and with a sustainably oriented or values-based mission (Breuer & Lüdeke-Freund, 2018).

Looking at a whole range of sustainability-oriented startups, several motives are conceivable side by side in various forms. Ethical-sustainable motives stand alongside the satisfaction of realizing a self-developed business idea or bringing an innovation to market and the desire to generate income from the company's profits. Combinations are thus conceivable that include the motivation of profit orientation and the desire to create added value for the society (Alberti & Varon Garrido, 2017; Breuer & Lüdeke-Freund, 2018). There may or may not be a trade-off between the two motives. The social contribution may incur costs and reduce profits, for example by paying suppliers fairly. In the case of a technical innovation for example to reduce CO₂ emissions, there is not necessarily a trade-off; the sustainability orientation is core to the business idea and at the same time does not reduce profit. In recent years the line between profit orientation and sustainability has become increasingly blurred, "hybrid firms" developed that combine characteristics from both (Alberti & Varon Garrido, 2017).

If several motives can stand side by side, the question arises as to the significance of sustainability orientation in the start-up process, as this motivation can possibly lead to a different approach and different business models. There are entrepreneurs who do not implement their business idea primarily out of an ethical drive or a sustainability-oriented mission, but who do consider sustainable aspects later when implementing their innovation (Boons & Lüdeke-Freund, 2013). In other words, they primarily want to be successful with an innovative business idea and generate profit, but do so while taking into account social and environmental needs (Thompson & MacMillan, 2010). For example, they consider ecological aspects in the energy supply for production and avoid CO₂ emissions, or they design products that can be easily disassembled into individual parts and recycled. These entrepreneurs are thus aware of the sustainable challenges facing our society and explicitly incorporate sustainability aspects into their business model.

Following Breuer and Lüdeke-Freund (2018), we distinguish the following categories: Sustainability is firstly integrated as a single component, e.g. by replacing a conventional pre-product with a sustainable one. The company is externally motivated by regulations or competition or demands of the clientele. The organization as a whole is not involved or integrated in sustainability aspects.

Second, sustainability is systematically integrated with several components and at one point in the business operation, e.g. with replacement of an entire product line, other distribution channels or similar. There is no comprehensive integration in several business areas.

Third, in a basically conventional business idea, sustainability is strategically integrated with a comprehensive sustainability process and management, e.g., with coordinated Corporate Social Responsibilities activities or the consideration of the sustainability impacts of the entire company.

Finally, in the fourth category sustainable value creation is at the core of the business idea, e.g. with a product-as-a-service system to reduce environmental impact, or a social initiative to include disadvantaged people. The founders' own motivation is present and finds expression in a comprehensive consideration of further sustainability aspects in business operations.

While categories one to three can be thought of as a process in which a company increasingly integrates sustainability aspects, level four is not necessarily reached as a further step. For these characteristics, such extensive changes to the business model are necessary that companies would basically have to start over. However, this category is well suited for describing companies that consider sustainability orientation as the core of their business idea from the beginning.

All manifestations are basically compatible with profit orientation, even if this will not always have the same priority. The sustainable entrepreneurs thus have several motivations, which can be pronounced to different degrees: the ethical convictions, profit orientation and possibly others, in order to be able to run their company without subsidies in the long term. Profit orientation usually leads to growth and thus to a spread of ethically desired action. As mentioned above, a strong profit orientation can get in the way of strictly sustainability oriented business models (Thompson & MacMillan, 2010). In principle, however, both sides can be reconciled (Boons & Lüdeke-Freund, 2013) and influence each other. In the case of non-profit enterprises, the profit orientation is not present at all, while the ethical motivation for it is usually particularly pronounced. NPOs primarily pursue social and environmental goals (Sarango-Lalangui et al., 2018). Looking at start-ups, these can be social organizations, for example, whose operation is not intended from the outset as the main source of income for the people involved or founding the organization.

2.2 The Triple Bottom Line of sustainability

Sustainable or, better, sustainability-oriented entrepreneurship as this implies an intention or attitude, differs from entrepreneurship in general in several respects. Entrepreneurs who act sustainably pursue not only economic but also ecological and/or social goals. These are also grouped under non-economic goals, e.g. in (Shepherd & Patzelt, 2011). Today, this so-called triple bottom line approach has become generally accepted, whereas initially sustainability was only understood as a consideration of ecological aspects (Sarango-Lalangui et al., 2018).

The three aspects of economic, ecological and social sustainability are often not covered to the same extent. For example, something could be produced conventionally and be ecologically questionable, but make a good social contribution. A contribution to sustainability is then recognizable, and it should not be definitively decided at this point in the evaluations whether a company can basically be described as sustainable or not. All three sustainability aspects for positioning a business idea should not stand side by side, but be understood as interwoven and integrated components of society (DIN, 2020, pp. 17, 18). In terms of environmental sustainability, the product, technology or service should improve the achievement of environmental goals. Examples are the preservation of biodiversity, reduction of pollution, reduction of CO₂ emissions,

efficient use of resources. Correspondingly, in terms of social sustainability, the product, technology, service should improve the achievement of social goals, like the consideration of the needs of the socially disadvantaged, poverty prevention, inclusion, development cooperation, fair treatment of employees and fair, non-discriminatory remuneration. Finally, in terms of economic sustainability, the product, technology or service should contribute to the economic strength of the country through entrepreneurial success. Through business activity, the production factors are remunerated (workforce, capital, other resources), and thus jobs and income are created for the population. This means that the contribution to the society is also considered in the economic sustainability aspect, and not just the profit orientation on the company level.

3 Sustainable business models

3.1 Sustainability in business models

In the last twenty years, the term "business model" has been shaped. The core feature is the description of a value creation, which is mentioned in many definitions. Osterwalder and Pigneur introduced the term Value Propositions. The business idea of a start-up or company should solve a problem for customers or satisfy their needs, respectively (Osterwalder & Pigneur, 2010). Based on this, they identified nine aspects, such as Customer Segments, Distribution Channels and others, which were clearly presented in the well-known Business Model Canvas.

Sustainability-oriented business models do not differ generally from the main criteria. However, sustainability aspects are integrated and presented. In summary, sustainability can thus be integrated into the definition of a business model (Schaltegger et al., 2016, p. 6):

"A business model for sustainability helps describing, analyzing, managing, and communicating (i) a company's sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers this value, (iii) and how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries. "

The view on the society outside the company becomes clear and ecological and social aspects are explicitly integrated as well as other stakeholders are mentioned. Boons and Lüdeke-Freund emphasize that the topic of sustainability should be represented throughout the entire business process (Boons & Lüdeke-Freund, 2013). The value proposition should create a balance between the three aspects of economy, ecology and social issues. These aspects should also be recognizable in the supply chain and infrastructure. Customers and other stakeholders should be motivated to behave responsibly. And finally, the financial model should also take into account ecological and social framework conditions. Breuer, Fichter, Lüdeke-Freund, and Tiemann define four principles as minimum requirements for a Sustainable Business Model (SBM): sustainability orientation, value creation in a broader sense with a view to society, systemic thinking with, for example, an understanding of the circular economy, and stakeholder integration (H Breuer et al., 2018). They derive more concrete requirements for the

development of SBM, such as consideration of the context, possible collaboration, and taking into account the impacts and outcomes of the business activity.

3.2 The linear economic model and circular economy

For an analysis of the material flow, the question of the business model can be further differentiated from an ecological point of view: are resources returned to the economic cycle in the sense of the circular economy, or does the business model promote resource efficiency in the linear model, or possibly neither? This distinction and a differentiated view is useful to be able to identify typical business models that contribute to a more circular economy and thus promote sustainability. The circular economy is therefore a goal under the umbrella concept of sustainability. The focus of circular economy concepts is mainly on economy and ecology, less on social aspects (Murray et al., 2017). Social aspects can, of course, be additionally considered.

The linear economic model "Take - Make - Waste" is predominant today. Resources are used to make products that are thrown in the trash after use. In contrast, in the "cradle-to-cradle" approach, resources are used longer or are reused or reintroduced into the material cycle after the end of use – the circle economy (McDonough & Braungart, 2002). Further variations are possible if sustainable business ideas enable a more efficient use of resources in the linear economic model. For example, new technology can reduce material consumption or energy consumption in a production process. The linear economic model thus becomes more sustainable, but still leads to the discarding of goods that are no longer used. The linear model is increasingly reaching its limits, due to the scarcity of natural raw materials or the disposal of large amounts of waste containing valuable resources (Walcher & Leube, 2017). According to current estimates, only 8.6% of resources worldwide are regenerated in the sense of the circular economy, while more than 90%, accordingly, are not fed back into the material cycle (PwC-WWF, 2021).

3.3 The concept of circular economy in business models

The problem has now been recognized, and the transition of current global production patterns to a circular economy is being pursued by political actors. Approaches can be found, for example, in the European Commission, which presented an action plan for the circular economy in 2015 (European Commission, 2015). In addition to closing material cycles, it is also intended to enable improved innovation capacity, new jobs and sustained economic growth in general.

The term circular economy is used in different ways, and a general definition has yet to be developed. One well-known definition of the circular economy comes from the Ellen MacArthur Foundation, which defines it as "an industrial economy that is restorative or regenerative by intention and design" (Ellen MacArthur Foundation, 2013, p. 14). This understanding of the circular economy aims to maintain products, components, and materials at their highest utility and value. The circular economy concept emerged from industrial ecology, the blue economy, the product-service system

(Camilleri, 2019; Tukker, 2015) and the cradle-to-cradle approach (Ellen MacArthur Foundation, 2013; McDonough & Braungart, 2002; SATW, 2014).

In the current discussion, the circular economy is understood as a closed system of resource use that decouples economic growth from problems such as environmental pollution and limited resources (Geissdoerfer et al., 2017). Reuse or remanufacturing and recycling are mentioned as methods (see Fig. 1). According to the Ellen MacArthur Foundation, circular economy is defined as an economic system that is regenerative and aims to keep resources and (partial) products at the highest possible use for society. Consequently, burning the waste to recover energy should only be the last choice as the material is lost forever. In the literature, the term circular economy is often generally understood to mean a sustainability contribution to improving the use of resources, with the designs then distinguishing whether the material cycle is actually closed or slowed down in one way or another (Antikainen & Valkokari, 2016; Bocken, 2020; Henry et al., 2020). The different design forms will now be described in order to be able to assign business model patterns to them further below.

Nancy Bocken (2020) distinguishes between 'narrowing', 'slowing' and closing resource loops under the umbrella term circular economy. Narrowing refers to the reduction of resource consumption through more efficient use of energy and materials. One can also speak of efficiency improvements. This is not circular economy in the strict sense, since less is consumed, but nothing is said about reuse of resources. So we are still in the linear model here, with an improvement in sustainability through more efficient use.

Slowing down the resource cycle means using products for a longer period of time, whether through repair, second-hand sale to a new owner, or multiple use through a sharing model (like car sharing). Here, resources are put back into the economic cycle (Bocken, 2020).

Closing the loop means putting materials back into the economic cycle. The best-known example is recycling. Products are dismantled or made available in another form as raw materials (Bocken, 2020). This can also be related to the biological cycle as a regeneration when organic material is composted.

The "5 R" (Henry et al., 2020) Reduce, Reuse, Regenerate, Recycle, Recover can thus be assigned to these categories:

Table 1. own compilation with (Bocken, 2020; Henry et al., 2020)

Sustainable business model strategies	Definition	narrowing, slowing, closing	Type circular or linear
Reduce	Reduce use of resources, efficient design and production	narrowing	linear
Reuse	Bring products back after initial use, repair, second-hand markets	slowing	circular in a broader sense/ finally linear

Regenerate	Benefits for and through the biological ecosystem, composting, green roofs, ..	closing	circular
Recycle	Process materials for using them again, upcycling, downcycling	closing	circular
Recover	Incinerate residuals and recover embodied energy, last option if others do not apply	closing	circular

The linear value chain and the circular economy can be mapped as follows.

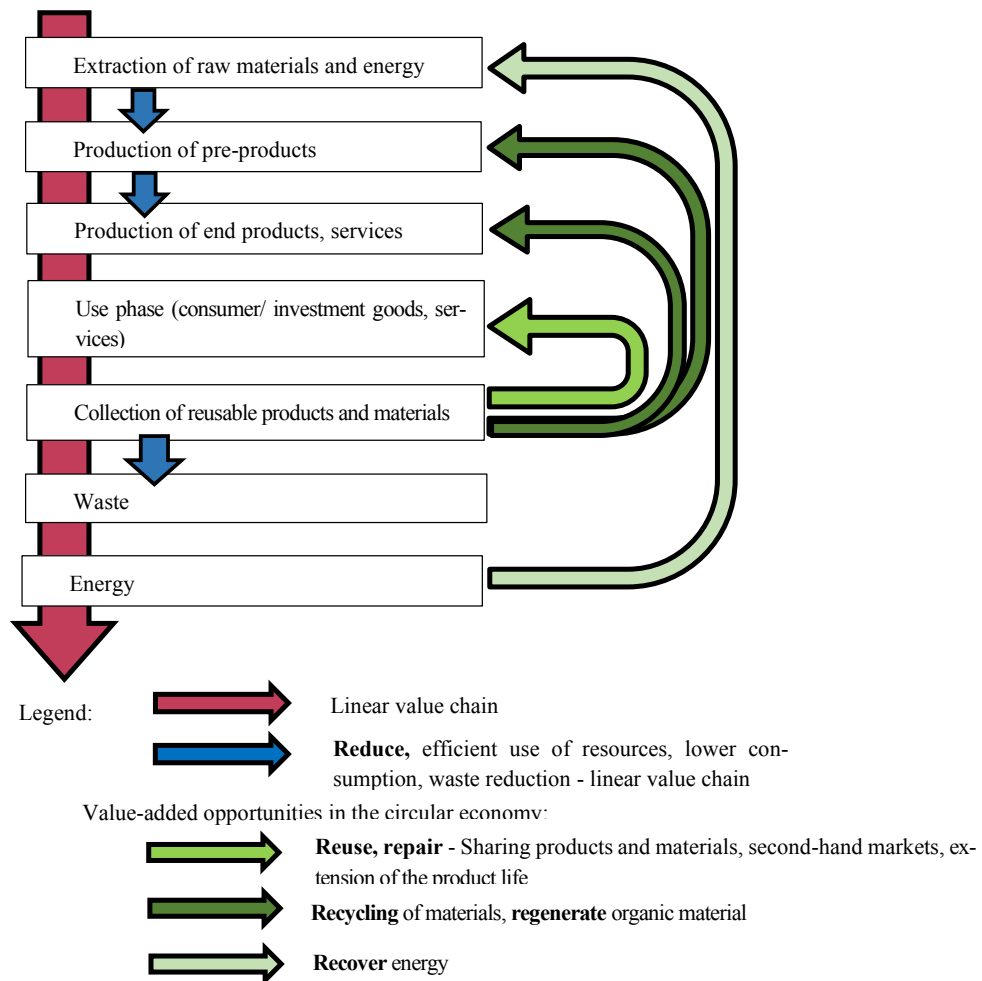


Fig. 1: Value creation opportunities in the circular economy, own illustration developed from (von Kutzschenbach & Milow, 2019).

To get a better overview of typical sustainability-oriented business models, companies can be further categorized according to their activity. These five types were identified: design-based, waste-based, platform-based, service-based and nature-based start-ups (Henry et al., 2020). However, the authors mainly have in mind start-ups with sustainability at their core. In another analysis, the categories were chosen more broadly so that many different sustainable business models could be represented. In an analysis 11 pattern groups with altogether 45 patterns were identified (Lüdeke-Freund et al., 2018). The idea was to have a rather complete picture of possible sustainability patterns in business models. The pattern groups will be used in this evaluation, with the detailed patterns providing further information about the categories.

Table 2. Sustainability patterns (pattern groups) in business models, following (Lüdeke-Freund et al., 2018)

Pattern	Description
G1 Pricing & Revenue Patterns	Addressing the revenue model of a business model, i.e., how offerings are priced and revenues generated. E.g. Differential pricing, freemium.
G2 Financing Patterns	Addressing the financing model within a business model, i.e., how equity, debt and operating capital are acquired. E.g. Microfinance, Crowd Funding.
G3 Ecodesign Patterns	Integration of ecological aspects into key activities and value propositions, i.e., how processes and offerings are designed to improve their ecological performance over their entire life cycle. Including reduction of resource use, higher efficiency.
G4 Closing-the-Loop Patterns	Integrating the idea of circular material and energy flows into partnerships, key activities, and customer channels, i.e., how materials and energy flow into, out of, and return to a company. E.g. Recycling, reuse, repair, take-back-management.
G5 Supply Chain Patterns	Modifying the upstream (partners, resources, capabilities) and/or downstream (customers, relationships, channels) components of a business model, i.e., how inputs are sourced and target groups are reached. E.g. shorter supply chains, produce on demand.
G6 Giving Patterns	Helping donate products or services to target groups in need, i.e., how costs are covered and social target groups are reached. E.g. buy-one-give-one.
G7 Access Provision Patterns	Creation of markets for otherwise neglected target groups, involving modified value propositions, channels, revenue, pricing and cost models, i.e., how value propositions are designed, delivered, and to whom. E.g. affordable housing, degrees.
G8 Social Mission Patterns	Integrating social target groups in need, including otherwise neglected groups, either as customers or productive partners, i.e., how customers, partners, and employees are defined and integrated. Including "high-tech for health" health improvement through innovative medical or pharmaceutical products

G9 Service & Performance Patterns	Emphasizing the functional and service value of products and that offer performance management, i.e., how value propositions are defined and delivered.
G10 Cooperative Patterns	Integrating a broad range of stakeholders as co-owners and co-managers, how partners are defined and how the organisation is governed. E.g. cooperative ownership.
G11 Community Platform Patterns	Patterns that substitute resource or product ownership with community-based access to resources and products, how value propositions are defined and delivered. E.g. sharing business.

These patterns are used to describe the main sustainability aspect of a business idea but do not incorporate information about the intensity or other sustainability aspects. It is therefore conceivable for a company to bring a technical innovation to market without any particular sustainability features and at the same time to treat its employees in a particularly social and participatory manner (social mission pattern). The pattern is not describing the whole business model but only the main sustainability aspect.

To sum up, a start-up's sustainability profile can be described with the general sustainability orientation, the contribution to the three pillars economic, ecologic, social, the degree of profit orientation, regarding ecologic sustainability with contributions to resource efficiency and the circular economy, in more detail described with the "5 R", and finally with typical sustainability patterns in business models.

An **Interview Guideline** was derived following the criteria just described. In a first section of the guideline the personal motivation and development of the business idea were addressed. Then the business concept and the business model were evaluated with the core topics of sustainability contribution according to the triple bottom line, the linear business model versus a circular economy concept with different characteristics and finally the business model patterns.

4 Evaluation of sustainability in the business models of Swiss Innovation Challenge participants

The entrepreneurial competitions under the brand Swiss Challenge were launched by the University of Applied Sciences and Arts Northwestern Switzerland (FHNW) in 2014 to provide practical education and training for both students and graduates. Entrepreneurial thinking and action of students and employees at university as well as beyond in business and society are promoted - participation in the competitions is open to start-ups in different entrepreneurial stages as well as too SME (FHNW, 2019b).

The Swiss Innovation Challenge lasts a total of eight months and includes three pitches of the participants with an evaluation of their business ideas and projects by a jury (FHNW, 2019a). During the competition, participants can attend free, user-oriented seminars. In addition, they have access to mentoring and coaching programs where they are supported and encouraged with practical knowledge. The data from the 2020 cohort were evaluated for this article. 25 teams in the second pitch were ready for an interview, which was conducted using a semi-structured interview guideline.

The contest participants are randomly distributed across different industries and business models. In this 2020 cohort, all participants were start-ups. The teams are planning an innovative business in the near future or they have started already within the last two calendar years. (Admission criteria, (FHNW, 2019a)).

First, the general sustainability orientation was examined. Being asked, some of the teams answered that they currently are too busy to deal with sustainability aspects, for example with interview partner 4 (I4). “At the moment, we are more focused on the economic goals, because as a young start-up, it is very important for us to be able to launch at some point and scale the business.” Others started talking about their general sustainability attitude but could not find those aspects in their start-up, like I22: “Our activity is mostly online and environmental protection is not an issue for us. This is neither positive nor negative. Basically, environmental protection is something we consider important. For example, we travel as much as possible by public transport and not by private car, but otherwise there are actually few decisions in our business or there is little in the area of environmental protection that has an influence on our decisions.”

Other interview partners instantly found some sustainability motives, some of them thought about before, others possibly recognized at the moment: “Ecological aspects are very important to us. We are a start-up that is already CO₂-neutral. Which is also not a matter of course, since it also costs a certain amount. That's why it was important for us from the very beginning. We produce as much as possible in Switzerland. In addition to the ecological aspect, we also want to strengthen Switzerland as a business location with our product. A social aspect is that it is also extremely important for us to have a very good relationship within the team as well and that the employees can work very well.” (I6)

The categories below were evaluated with the ranges from 0, not applicable, to 4, the core of the business idea.

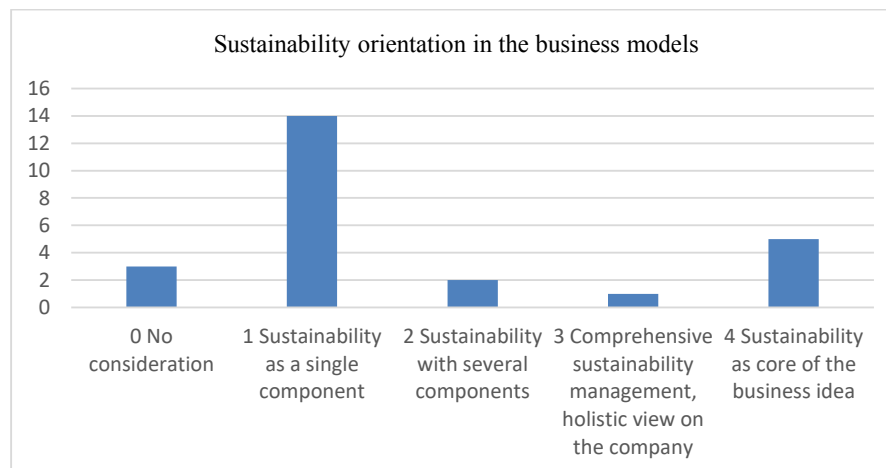


Fig. 2, sustainability orientation, own evaluation

While three of the 25 start-ups did not at all contribute to sustainability, 14 did so with a single component. For example, they use energy from renewable resources but otherwise did not implement sustainability aspects into their business operations or have a holistic sustainability approach. There were few companies in the mid-range but 20% (5) have an explicit sustainable business idea, like in I1: “The goal is petroleum substitution. There are basically two sources of carbon that could replace petroleum. That is CO₂ from the air and plants, and we see a lot of potential in plants because we already have a lot of agriculture and the conversion will be much faster. That's why we've developed a process that can get petroleum-like molecules from plants.”

Next, the sustainability contribution of the products or services was closer examined with respect to the three pillars of sustainability. The projects were evaluated about their contribution to the economy, the ecology and/or to the society with a range of “not at all” to “high contribution” (0 to 4).

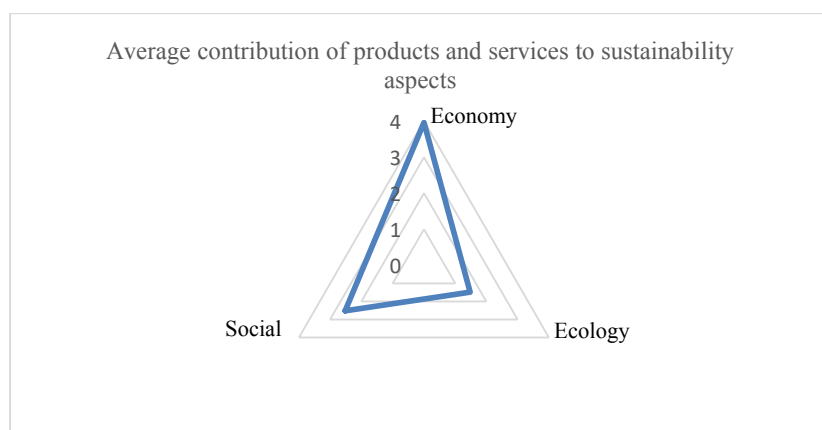


Fig. 3, contribution to three pillars of sustainability, own evaluation

While almost all start-ups have a strong economic focus, only some contribute to social sustainability and to a lesser extent, and even fewer to ecologic sustainability. This is in line with the profit orientation of the start-ups. The business models were categorized with respect to their profit orientation. We learnt above that this is not necessarily connected to sustainability orientation, and a fully profit oriented company can at the same time strongly contribute to sustainability. Still, there might be a relationship as the core sustainability oriented companies could be less profit oriented. With this evaluation a correlation could be examined in this group.

Quite a few interviewees were very clear about the profit orientation of their company. “We are purely profit driven. We believe that by building a company that tries to get an impact or the most out of these devices, we have the greatest impact this way.” (I15), or “We want to build a viable company. So simple.... At the moment, we are purely profit oriented.” (I2). One argument for a strong profit orientation can be the funding of expensive investments, “it takes so much money to build a new chemical plant (...) It would be several hundred million to build such a thing, and unfortunately

no one does that today without hoping that the thing will spit out the money again.” (I1).

The interviewer discussed the topic with the participants and then decided the best fitting category from profit to non-profit orientation.

Table 3. Degrees of profit orientation

Profit orientation	Number
Profit oriented	12
Profit orientation first priority, among other goals	12
Mainly not profit oriented goals but want to make a profit, after all	1
Non-profit	0

We see that generally the interviewed participants were profit oriented but quite a few also follow other goals. The five start-ups that are very sustainability oriented (see above) obviously also have a strong profit orientation.

Next, the ecologic sustainability with respect to resource and energy efficiency in the linear model and contributions to the circular economy are examined. The interviews show that most of the start-ups have a linear business model. Some contribute to a very limited extent to the circular economy, like I5: “In the area of recycling, reuse, circulation (...) it is actually only the packaging that we bring back into the cycle and reuse. We also don't really have any waste from production that we could put back into the production process afterwards. That is actually all.” Others argue that with producing a software, there is no material that could be reused or recycled, like I2 “by offering Software as a Service it is a linear business model.” At the same time, I2 explains that in the linear model the company contributes to energy efficiency, “we are an enabler that our customers can plan more sustainable buildings. (...) In terms of CO2 reduction, [lower] energy consumption.” Finally, few contribute to closing the resource loops, like I1 with an idea to replace fossil products, “The circular economy is one reason for our idea. If you need biomass from wood or agricultural waste, that's already CO2 that was in the air, then in the plant and you borrow it, so to speak.”

The four categories are shown in the following table. Compared to table 1, the different types of actual circular economy business models are aggregated here in one category.

Table 4. Circular economy and linear economic model

Circular economy - linear economic model	Number
Linear economic model without sustainability contribution	15
Improve resource, energy efficiency – reduce, in the linear model	5
Slowing resource use: reuse, repair, (sharing, 2nd hand, ..., still linear model)	1
Closing the Loops: recycling for new products, actual circular economy, regenerate (biological), recovery (energy).	4

Then, the circular economy business models were separated according to the “5 R”, reduce, reuse, regenerate, recycle, recover. The picture was very similar to the previous table 4. All four start-ups with a circular business model were of the type “recycle”.

For a more differentiated picture, the interviewed start-ups were categorized in terms of their sustainability patterns. Some patterns did not occur among the 25 participants, but others were particularly frequent.

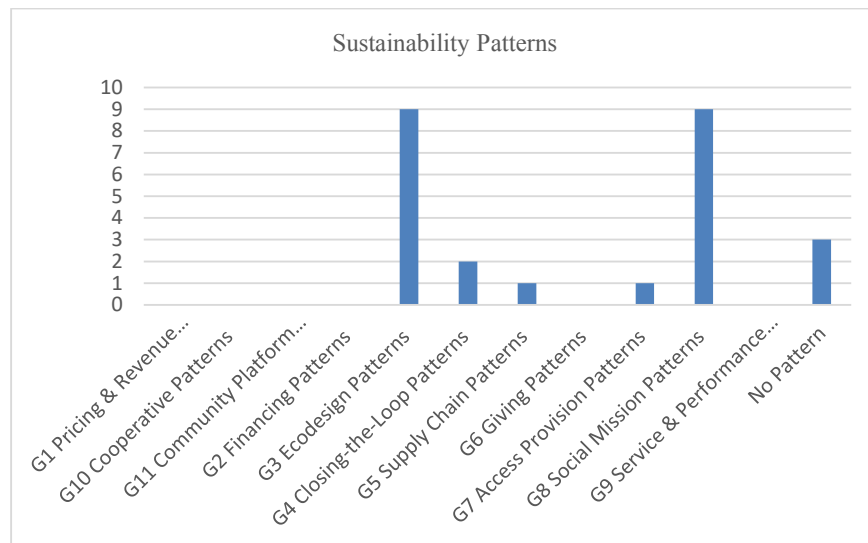


Fig. 4. Patterns of sustainable business models, own evaluation

There are two clusters in the pattern types, ecodesign and social mission patterns, with nine start-ups each. For the classification the strongest component determined the pattern category. A recyclable new waterproof membrane for outdoor clothing for example is both, an innovative ecodesign, and at the same time contributing to closing the resource loops. In this case, the ecodesign is regarded dominant. This explains that we found above four companies in the circular economy category, but here we have only two for the closing-the-loop pattern.

5 Discussion

The main question of this paper is to what extent the interviewed mostly conventional start-ups take sustainability aspects into account, and which ones in detail. The typical participant of the 25 teams that had been interviewed is profit oriented with some awareness of sustainability topics, but often this is only implemented in the business as a single component. There are also some few start-ups with a strong sustainability orientation. The mid-range seems to be almost missing – either they are implementing sustainability aspects to a large extent or not very much.

A social focus was more represented than an ecologic one, looking at the triple bottom line of sustainability. This is in line with the peak for social mission patterns. The social mission patterns include health improvements, here med-tech or pharmaceuticals. There were quite a few among the participants. And these typically do not contribute to a circular economy or a slowing or narrowing of the value chains. Consequently, we found a relatively high number of start-ups in the linear model with no such contribution.

Looking at the sustainability patterns in detail, we find in an analysis of ecological aspects another typical combination. Some Start-ups contribute to sustainability only with a single component, and this is often a reduction of resource, energy or carbon dioxide use, for example when using an electric car. Although this is no high level regarding overall achievable sustainability of a start-up and not a real innovation, these actions counted as ecodesign in the sub-pattern “substitute with renewable processes”, as no other matching category was available. This explains the high number of ecodesign patterns. At the same time, we see that for further research the categories (Lüdeke-Freund et al., 2018) have to be revised to be applicable also for companies that do not have a strong sustainability focus.

Examining the results for the “5 R”, the clusters of cases in the categories “reduce” and “recycle” (see table 4) is in line with results of an examination of 128 sustainability oriented business models (Henry et al., 2020) – here the accumulation of cases was in the same two categories. An interpretation could be that a reduction of resource or energy use is an easily reachable goal, and recycling seems to be the dominant way of implementing circular economy ideas. Further research could verify this.

6 Conclusion

The initial assumption that many of the competition participants do not follow a sustainability path as the core of their business model was confirmed. While the attitude of quite a few management teams was sustainability oriented, the implementation in the companies was mostly not advanced. Typical sustainability contributions and their intensity of the start-ups could be elaborated. Among the interview participants there were several with a social contribution in the health sector, while a group of other conventional start-ups only contribute with one energy-related aspect like carbon dioxide reduction. There was no broad range of circular economy business models. Further support and training for start-ups could encourage the implementation of these circular economy ideas that will help to make our planet livable also for future generations. The categories of this analysis turned out to be useful for describing the start-up’ sustainability orientation. The sustainability patterns have to be revised, though, to better map business models with a less strong sustainability orientation.

Further research could evaluate the contribution of the business models to the United Nations’ Sustainable Development Goals and include an analysis of the industries of the start-ups, combined with the sustainability patterns. Over the years, we will have more data in the Swiss Innovation Challenge for a more substantiated analysis. On an individual company’s level, the sustainability criteria from this article could be used to

develop a profile for positioning, communication to the stakeholders and as an incentive to improve the weaker areas.

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Awareness on Financial Cybercrimes among Youth: Experience, Exposure and Effect

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Abstract. After converging into information technology in the last three decades, Malaysia has transformed into a regional Information Communication Technology (ICT) hub. Despite its bundle benefits to the user, the package comes together with related risk exposures and has gradually evolved since then. The purpose of this paper is to find out whether the constructs related to the awareness of youth in terms of experience, exposure, effects of financial cyber-crime. This study adopts a quantitative approach by using Pearson's correlation analysis to explain the data which has been collected through a structured questionnaire. A total of 242 respondents have participated in this study via a convenience sampling method. The finding revealed that youth are reasonably aware of the financial cybercrimes based on the constructs used in this study. Although this research has been carefully prepared and achieved its goals, it is still known that researchers are limited and deficient. Firstly, the scope of analysis will likely be limited by the scarcity of evidence or reliable data. Most journals have found that there is a dearth of information on e-banking in Malaysia compared to other developing countries.

Keywords: *cybercrime, youth, financial, awareness*

1 Introduction

Financial technology nowadays has become one of the strength pillars to the growth of a nation. After converging into information technology in the last three decades, Malaysia has transformed into a regional ICT hub. As stated in Shared Prosperity Vision 2030, one of the biggest challenges refrained the nation from moving forward is due to the lack of participation among industrials in digital economy. Until recently, the outbreak of pandemic has caused stir to the global economic well-being and thus increased the usage of virtual transaction among users. The finance analyst, Jonathan Curtis, sees the boom effect of technological sector and makes his statement, 'the big opportunity in this space is digital transformation' (The Edge Markets, 2020).

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Hitherto, the banking activities is in the traditional form of transaction such as cash payments, cheques, or bank drafts. Moving forward this trend has paved a way to a modern system of payment in the form of swiping of debit cards or credit cards. The adoption of financial technology is perceived as a cost-effective strategy and recognized for its privilege to bring greater efficiency and productivity. Many financial and non-financial institutions invest in technological invention to create an added value to the company and remain competitive in the years ahead.

Though the benefits of technology are undeniably robust, the weaknesses are just at par (Agrawal S., 2016). Technological advancement leads to digital invention of many opportunities to the economic activities. Despite its growing demand in technological sector, the financial cybercrimes also go on strike and show an increase trend since Movement Restricted Order (MCO). This is proven by the fact that the number of cybercrime attack has increased for the same period as MCO from March 18 to April 7 by 82.5% from 417 cases in year 2018, 459 cases in year 2019 and recently the cases has jumped to 838 (TheStar, 2020). As of this year, the total cybercrimes cases in April alone is 1488 and attain the highest fraud case (MyCert, 2020). While the banking sector was able to reach more customers with the emergence of advanced technology, it also increased the risk for customers, who often have doubts and insecurity regarding these services.

There are several types of cyber-criminal activity which has been recognized as serious crime in Malaysia such as cyber harassment, intrusion attempt, intrusion, vulnerabilities report, denial of service, fraud, malicious codes, spam, and content related. The laws regulated purposely for cybercrime are as follows; Computer Crime Act 1997, Communications and Multimedia Act 1998, Malaysian Communications and Multimedia Commission Act 1998, Digital Signature Act 1997, Copyright Act (Amendment) 1997, Telemedicine Act 1997, Optical Disc Act 2000 and Electronic Transactions Act (2006). As part of initiative to counter the rising cybercrime cases, it is important to educate the young generations on awareness about cyber law and regulations (Chanuvai Narahari & Shah, 2016).

At present, cybercrime is a growing threat and is most prevalent in the digital world since individuals and groups rely more on information technology to finish off the dealings with faster transaction such as online banking over automated teller machines (ATM). The rapid use of the internet and other technology in the banking sector has increased the likelihood of cyber threat across the world such as scammers, phishing, hacking etc. Hence, it is necessary for researchers to investigate and review the cybercrime scenario in a country because it is new in Malaysia. The user of financial technology has no age limit, thus vast number of people will find this study helpful for them especially related industry such as technological sector to come up with defensive blocking system due to increasing cybercrime cases in financial sector, youth who actively connected to the internet, government agencies and public institutions. The purpose of this paper is to find out on the constructs related to the youth awareness on financial cybercrimes in terms of, experience, exposure, and effects.

2 Literature Review

2.1 Financial cybercrimes

Though technology makes things easier, effective, and efficient, the misuse of technology by some irresponsible parties has led to a gruesome situation. Besides, the age of a person is not a pre-requisite from being a victim of this growing concern issue. Together in this, Amro (2017) said, “with an increasing number of individuals staying in touch using mobile devices, cyber threats are becoming increasingly prevalent among all age groups.” It is well explained by Albert (2018), who emphasized the responsibility of young generation to protect older adults from being a victim of cybercrime as nowadays they are the most vulnerable target aimed by cybercriminals. Therefore, the youth should be playing the role and well-adapted with knowledge to exercise the duty.

As described by Agrawal S. (2016), internet banking users should stay cautious from financial cybercrime and be able to avert fraud and take a necessary step for security mechanisms so that they do not become victims of cybercrimes. In another part of the world, cybercrime cases in Africa also depicting a rising figure as evidenced by the country's annual losses to cybercrimes were estimated for Nigeria at \$649 million, and Kenya at \$210 million. In pursuance to this issue, Kshetri (2019) offered his thought in cybersecurity legislation and enforcement measures in the continent to further counter the rising cases.

This study adopts Routine Activity Theory (RAT) and Lifestyle Exposure Theory (LET) in the study as it ideally clarified cyber criminology and its consequences to the young and youth age. According to the Leukfeldt & Yar (2016) and Williams et al. (2019), the former theory is explaining victimization of cybercrime and its connection to the business cybercrime. On the other hand, the latter suggests that different lifestyle may expose people to different circumstances and it ends up getting into crime-prone situations which lead to a higher risk of victimization (Elly, n.d.). Rendering to Mugari, Gona, Maunga, & Chiyambiro, (2016), several types of cybercrimes such as hacking, phishing, identity theft and malware are amongst the threat of financial sectors in Zimbabwe. As conformed by Chevers (2019), who perceive the usage and frequency of using electronic banking are influenced by the first three crimes mentioned earlier as negative impact to adoption of electronic banking due to its continual escalation in financial cybercrime.

2.2 The experience of financial cybercrimes

As demand for access to online banking continues to increase and many customers rely on technology at fingertip for managing their finances, banks and other financial service companies would ensure that these transactions are convenient to perform. In a study conducted by Virtanen (2017), he summarized that, “experiences with hacked accounts

or cyberattacks also intensifies the fear of those with low confidence more than those with a higher amount of confidence.” Therefore, he stands on his argument that social and physical vulnerabilities as well as victimization have direct and indirect effects on fear of cybercrime.

It is fairly important to be able to study on the likelihood behavior to become a victim of cybercrime. Van de Weijer & Leukfeldt (2017) agreed that only individuals with higher scores on openness to experience have higher odds of becoming a victim of cyber-enabled crimes.

H₀: Victim experience has no significant correlation to the youth awareness on financial cybercrimes

H₁: Victim experience has significant correlation to the youth awareness on financial cybercrime

2.3 The exposure of financial cybercrimes

The existence of cybercrimes has generated element of risk exposure that give effects to the personal harm and organizational harm. According to Verma, Hussain & Kushwah (2012), the risk exposure includes several items which are financial losses, regulatory issues, data breach liabilities, damage to brand and reputation, and loss of client and public confidence. Exposure is perceived as one of the major components to be victimised in cybercrimes (Phillips, 2015).

H₀: The risk exposure of using electronic banking has no significant correlation to the youth awareness of financial cybercrime

H₂: The risk exposure of using electronic banking has significant correlation to the youth awareness of financial cybercrime

2.4 The effects of financial cybercrimes

The person who involve in making the cybercriminals have developed advanced technique that increase the types of cybercrimes such as spying the business activities and access important business information which indirect impacts the bank’s finances. This is supported by who has similar views on the impact of cybercrimes towards financial activities. The effects of a single, successful cyber-attack can have far-reaching implications, including financial losses, theft of intellectual property, and loss of consumer confidence and trust.

Becoming the victim of cybercrimes can have a long-lasting effect in an individual’s life. In a study investigated by Kaakinen, Keipi, Räsänen, & Oksanen (2018), the result indicated as per se, “analogously to crime victimization in the offline context, cybercrime is a harmful experience whose negative effects mainly concern those users who have weak social ties offline to aid in coping with such stressors.”

H₀: Acknowledge the effect of using electronic banking has no significant correlation to the youth awareness on financial cybercrimes

H₃: Acknowledge the effect of using electronic banking has significant correlation to the youth awareness on financial cybercrimes

3 Method

3.1 Research Design

This study is conducted in a quantitative manner. The aim of the study was to determine whether fourth-year students in the Faculty of Entrepreneurship and Business (FKP) at University Malaysia Kelantan's City Campus were aware of cybercrimes involving the e-banking system. In this report, descriptive and correlation analysis were used. As interpreted, the intention of the analysis was to investigate the relationship between the motives and the independent variables.

3.2 Unit of Analysis

The unit of analysis of this research will be the fourth-year students in Faculty of Entrepreneurship and Business at University Malaysia Kelantan. The respondents involved are the student selected courses, such as Logistics, Islamic Banking and Finance, Commerce and Retail, who are most likely using e-banking system.

3.3 Quantitative Research

A sample size can be defined as a subset of population. According to Roscoe (1975), sample size larger than 30 and less than 500 are appropriate for most research. By studying the samples, (Sekaran, 2010) has verbalized that the researcher should be able to meet the interest of the population. Since the total number of elements in the population frame cannot be ascertained due to unavailability of data, a precise number of samples cannot be drawn to represent the population.

Table 1: Krejcie and Morgan Sample Size Table

<i>Table for Determining Sample Size of a Known Population</i>									
N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Note: N is Population Size; S is Sample Size *Source: Krejcie & Morgan, 1970*

Based on Krejcie and Morgan (1970) table above, researcher will select 242 students as a sample from the total of 681 students. The respondents will answer the questionnaire itemized on the awareness of cybercrimes involved in the e-banking system among fourth year students in Faculty of Entrepreneurship and Business at University Malaysia Kelantan.

3.4 Development of Questionnaire

There are three sections in this questionnaire. First is section A which will discuss about the background of the respondents. Then, section B contains the question about the dependent variables (generally). Lastly, Section C, D and E explains the questionnaire item on each independent variable; the experience of cybercrimes in e-banking, exposure of cybercrimes in e-banking and effect of cybercrimes in e-banking. All the items to be included in the questionnaire were set on three points of scale, which is interpreted such as:

3.5 Data Analysis Procedure

Research data are collected frequently either by qualitative or quantitative methods (Hawe, Degeling, Hall, 1990). Questionnaires, surveys, and other quantitative approaches are used to collect data. According to Babbie (2010), numerical data and generalization across groups of people are collected and explained in a quantitative research. According to Avasarikar (2007), primary data is a term for data collected for a specific purpose, such as the preferences of researchers' requirements for any research problems.

The researcher uses a questionnaire method to gather all information in this research. Usually, questionnaire approaches are less costly and easier to perform. They are also relatively easy to implement because they are structured and free of many forms of error. It is usually intended for large amounts of quantitative data collection. A set of questionnaires will be distributed to the students. Respondents will be asked to answer all the questions in a timely manner. Respondents are also aided in clarifying the questions.

The data collected from the survey questionnaire will be calculated and evaluated with software version 23.0 of the Statistical Social Science Package (SPSS). The analysis of the data will be construed as two stages. The first phase of the data analysis includes the conduct of an analysis of the data to examine the data before any statistical procedures are adopted. The raw results, average values and relative values are calculated for each respondent. These data are the basis for further analysis.

3.6 Validity and Reliability

The concepts of validity and reliability were also used in this study. It is to understand how to minimize the possibility of errors and tendencies by increasing the data's reliability and validity. Conferring to Messick (1989), validity evolved into a complicated

concept. It is more closely related to the conclusion based on the assessment results. That is more focused on the outcome of the speculation that makes it implied. This evaluating consideration must be accurate and declare the truth. The assessment or evaluation should not be valid; only the assumption about this evaluation should be valid. Reliability coefficient assesses the consistency of the entire scale with Cronbach's Alpha being the most widely used measure (Nunnally, 1979). On other hand, the validity is the extent to which an instrument measures it is supposed to measure (Wiersma, 2000).

4 Results

After collecting the data from the respondents, the results of the research are started to analyze. To do so, the results collected from the distributed questionnaires were entered into the Statistical Package for Social Science (SPSS) version 23.0. Section A, which is the demographic part is first to be analyzed according to the questionnaire, that consist of gender, age, race, course and where do they access internet the most. Then, section B, C, D and E where it includes the Likert Scale measurement for every question asked to assess youths' understanding towards financial cybercrime.

4.1 Cronbach's Alpha

As shown in the Table 1, Cronbach's alpha is used to measure internal consistency or reliability of the items. To understand whether the questions in this questionnaire all are reliably measured the same latent variable, a Cronbach's alpha was measured on a sample size of 30 respondents.

Table 2: Cronbach's Alpha Coefficient Range

No	Coefficient of Cronbach's Alpha	Reliability Level
1	More than 0.90	Excellent
2	0.80-0.89	Good
3	0.70-0.79	Acceptable
4	0.60-0.69	Questionable
5	0.50-0.59	Poor
6	Less than 0.59	Unacceptable

The overall result of Cronbach's alpha is **0.974**, which indicates too high as it may have similarity and overlapping of the items since the suggested alpha value should be in within 0.65 to 0.95 (Piaw, 2012).

Table 3: Reliability Statistics

Cronbach's Alpha	N of Items
.974	20

4.2 Demographic Profile

Demographic profile is used to describe the phenomenon of a variable. In this study, categorical variables such as nominal and dichotomous were used to further assess the background of the sample such as gender, age, race, and internet accessibility.

Table 4: Demographic Analysis

No.	Profile	Description	Frequency	Percentage (%)
1.	Gender	Male	81	33.5
		Female	161	66.5
2.	Age	16-20	124	51.2
		21-25	103	42.6
		26-30	15	6.2
3.	Race	Malay	185	76.4
		Chinese	34	14.0
		Indian	21	8.7
		Others	2	0.8
4.	Internet sources	Home	69	28.5
		College	165	68.2
		Cyber café	1	0.4
		Others	7	2.9

Table 3 demonstrated a summarization of frequency analysis for 242 respondents who had participated in this survey. Firstly, most of the respondents are female which constitutes 66.5% (161 respondents), while male consists of 33.5 % (81 respondents). Meanwhile, majority of them aged from 16 to 20 years old with 51.2 % (124 respondents), followed by those who aged 21 to 25 years old with 42.6% (103 respondents) and the rest is 6.2% (15 respondents).

Of the total respondents, 76.4 % (185 respondent) answered by Malay respondents compared to Chinese with 14 % (34 respondents) and 8.7% (21 respondents) among

Indian. The remaining of 0.8 % (2 respondents) were from other races. This can be concluded that Malay was most of the youth population in the community.

According to the respondents, many of them get access to the internet from college approximately 68.2 % (165 respondents), then home is the second place where they highly accessed the internet constitutes of 28.5 % (69 respondents), while 2.9 % of respondents prefer other places to access (7 respondents and lastly access at cyber cafe with 0.4 % (1 respondents). Therefore, those who are staying in the campus are the most users of internet.

4.3 Descriptive Analysis

Descriptive analysis is a method used by researchers to identify the number in statistical interpretations and sum of the value. This study relies on mean and standard deviations to explain the measure of dispersion.

Table 5: Result of Descriptive Statistic

Variables	Mean	Std. De- viation
Influenced factors		
Experience (IV1)	3.11	0.462
Exposure (IV2)	3.34	0.481
Effect (IV3)	3.29	0.503
Awareness of cybercrimes	3.23	0.491

The table above shows, the summary of descriptive statistics of the influenced factors in this study. From the results, the highest mean belongs to exposure which obtain 3.34 while the lowest mean is 3.11 for experience factor. Meanwhile the effect factor shows the strongest dispersion of 0.503 and the lowest is experience at 0.462. The average dispersion measured by these analyses are 3.23 and 0.491, respectively.

4.4 Pearson Correlation Analysis

As part of inferential analysis, its purpose is seen important to describe the characteristics of the research subjects by identifying the relationship of the variables. SPSS is used in this part to analyze if there exist a strong strength of association between the two variables involved. Along this line, the dependent variable of the research is youth awareness towards financial cybercrimes while the independent variable is experience, exposures, and effects.

Table 6: Rule of Thumb for Interpreting the Size of a Correlation Coefficient

Size of Correlation	Interpretation
.90 to 1.00 (-.90 to -1.00)	Very high positive (negative) correlation
.70 to .90 (-.70 to -.90)	High positive (negative) correlation
.50 to .70 (-.50 to -.70)	Moderate positive (negative) correlation
.30 to .50 (-.30 to -.50)	Low positive (negative) correlation
.00 to .30 (.00 to -.30)	negligible correlation

Table 3 portrays the rule of thumb for interpreting the size of a correlation coefficient as it describes the strength of the relationship among the variables. The connection coefficient or allude as r . If value of r is $+1.0$, there is an impeccable positive relationship and if the estimation of r is -0.1 , it immaculate the negative relationship of the factors. When the point estimation is $r=0$, it is demonstrated as no relationship between the factors of the research.

		Awareness
Experience	Pearson Correlation	.651**
	Sig. (2-tailed)	.000
	N	242
Exposure	Pearson Correlation	.589**
	Sig. (2-tailed)	.000
	N	242
Effect	Pearson Correlation	.503**
	Sig. (2-tailed)	.000
	N	242

The value of correlation coefficient for awareness of youth and experience is 0.651 which indicates a moderate relationship. The p-value is significant at 0.000 which is lower than 0.01. From the results attained, it can be concluded that experience has positive strength of relationship to the awareness of financial cybercrime among youth. Therefore, this be can concluded that H_1 is accepted.

Meanwhile, the value of correlation coefficient for awareness of youth towards exposure of cybercrime is 0.589 and thus defines moderate relationship for both of variables. The p-value is 0.000 which is lower than 0.01. As stated in the table above, there

exists a positive strength between exposure and awareness of financial cybercrimes which explains. Thus, H_2 is accepted.

The above table specifies on the value of correlation coefficient between awareness of youth and effects of cybercrime is 0.503 which implies moderate relationship. The p-value is significant at 0.000 since it is lower than 0.01. Again, H_3 is accepted.

The questionnaires were first analyzed by using Cronbach Alpha. Back to the main purpose of this study is to test the strength of relationship between experiences, exposures and effects towards youth awareness in virtual transaction. From the result, the relationship strength of all independent variable towards the dependent variable is moderately correlated with $r = 0.651$ (experiences), $r = 0.589$ (exposures) and $r = 0.503$ (effects) which is significant at the 0.01 level (2-tailed). It seems to suggest that all the independent variable are the factors that represent the youth awareness towards financial cybercrimes. To sum up, all the hypotheses are significant and accepted. These hypotheses have significant values of 0.000 which are less than 0.05.

5 Conclusion

This chapter will discuss and review the result and supported by the previous study. A total of 242 questionnaires were distributed to University Malaysia Kelantan students (UMK). Initially, a reliability test was used to analyze the questionnaires. The demographic profile was then examined by using frequency analysis such as gender, age, race, course, and internet sources.

The population of students has been evaluated to address the phenomenon at university level in the matter of financial cybercrimes. The demographic profile shows that 33.5% of those interviewed come from men and 66.5% from women. Furthermore, 124 people (51.2%) are between 21 and 22 years of age and less than 25 years of age and above are respondents. 185 (76.4 percent) respondents reported that they were Malay. Each course excludes 24.4% retail course while others remain at 25.2% per course. In addition, most of them have internet connectivity in the university.

In this research, the hypothesis is to test the relationship between experience, exposure, and effect of using electronic banking towards awareness in financial cybercrimes. The relationships between all independent variables and dependent variable are correlated by the hypothesis, which are important at the 0.01 level, to $r = 0.650$ (experiences), to $r = 0.589$ (exposures) and to $r = 0.503$ (effects). This makes it clear that all the factors are associated to the awareness in cybercrimes. All hypotheses are substantial and accepted in summary. To conclude, the cybersecurity is becoming an intense headline nowadays since it is in high demand due to increasing figure of cybercrime cases. The drive towards Fourth Industrialization Revolution (IR 4.0) will come together with risk of cyberattacks. Thus, the call for adopting a common language and framework around cybersecurity should be exercised immediately before losing more to it.

Furthermore, strong cybercrime governance and legislation and policies with specific emphasis on tackling electronic channel-based fraud. Organization require a comprehensive enterprise-wide approach to cybercrime management that supports broader organizational compliance and risk management. The path to this approach includes an information technology (IT) infrastructure that enables enterprise-wide, real time, and cross-channel monitoring and management capabilities. Bank institutions should work towards developing digital forensic auditors.

Although this research has been carefully prepared and achieved its goals, it is still known that researchers are limited and deficient. Firstly, the scope of analysis will likely be limited by scarcity of evidence or reliable data. Most journals have found that there is a dearth of information on e-banking in Malaysia compared to other developing countries. Moreover, the studies affect only 242 students at the Malaysia Kelantan University, the City Campus as a sample and do not represent the entire population at Kelantan University. A wide range of research is therefore recommended and preferable. The limitation issue that occurs in this research should be addressed in future research. If the scope of the study is wider, the results of the research are better and the community such as students and staff can benefit significantly. Conversely, the study should be conducted using a qualitative approach, in which the researcher will interview the respondent to obtain knowledge from their own perspective about their own experience, how aware they are of cybercrime, and what impact cybercrime has had on them.

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The Development of *Maqasid Shari'ah*-based Performance Measurement of Islamic Banks: A Review

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Abstract. This paper reviews and revisits the existing studies on the development and application of *Maqasid Shari'ah-based* in measuring Islamic banks' performance. At present there is very limited rigorous research on the application of *Maqasid Shari'ah* and the performance of Islamic banks. Despite this situation, past empirical papers relating to the application of *Maqasid Shari'ah* in measuring the performance of Islamic banks were selected for review and analysis. The literature review shows that the past study on the development of the *Maqasid Shari'ah-based* in measuring the performance of Islamic banks primarily refers to the pioneering work of Mohammed et al. (2008) and the development of the *Maqasid Shari'ah-based* index mostly focus on the component of necessities of the *Maslahah*. There is a dearth of study that provides empirical evidence on the Islamic banks' performance using the *Maqasid Shari'ah-based* index and measurement. This paper addresses the pattern and literature gaps on the past study on the *Maqasid Shari'ah-based* performance measurement that would serve the interest of the academic researchers, practitioners, regulators, and policymakers in reviewing Islamic banks' performance in attaining the objectives of *Shari'ah*.

Keywords: Islamic Banks, Performance, *Maqasid Shari'ah*

1 Introduction

Despite the unsustainability of the first Islamic interest-free bank, Mit Ghmar, Egypt, that was established in 1963, the Islamic banking industry has been growing tremendously across the globe. The Mit Ghmar project serves as a kickstart for the development of the Islamic banking industry. An inter-governmental Islamic bank Islamic Development Bank was later established in 1975 in the effort to promote social and economic growth in the member countries and Muslim communities across the globe. Today, the Islamic banking industry is the major player of the Islamic finance industry in

which it contributes about 69% of the total assets or USD 1,993 billion of the global Islamic finance industry with annual growth of 14%, consisting of 526 Islamic banks, including windows, in 72 countries across the world. Currently, Islamic banks' assets contribute 6% to the total global banking assets [1]. It has been growing fast and tremendously in contributing to the economic and social sectors.

Along with the Islamic banking industry's growth, Islamic banks need performance measurement that depicts Islamic banks' true performance in achieving their mission and vision since Islamic banks have different concepts and practices from the conventional banks [2]. Nevertheless, the debate on the ideal measurement of Islamic banks' performance has been prolonging for many years. Islamic banks are overwhelmed with the issue of inadequate and insufficient performance measurements that could cater to their unique characteristics and aberrant features. Most of the past studies focus using financial performance using similar measurements that have been used in measuring the performance of conventional banks, including ratios of profitability, efficiency, earnings, liquidity, credit risk and assets activity [3-20]. These measures, however, lack and insufficient in capturing the unique philosophies and principles of Islamic banks have achieved the *maqasid Shari'ah*. Islamic banks also need performance measurement that could cater to both shareholder and stakeholder interest in the forms of financial and non-financial ratios [21]. Islamic banking principles are underpinned by Islamic economic philosophy derived from *Shari'ah*, where the sources are divine revelations are from the Quran and Sunnah. Thus, the vision and mission of Islamic banks' business activities should be aligned towards attaining the objectives of *Shari'ah* (*maqasid Shari'ah*) [22].

However, there is still a dearth of literature concerning the usage of *maqasid Shari'ah* in Islamic banks' performance measurements. Past research on the performance measurements of Islamic banks is basically still tied to the measurements that have been used in measuring the performance of conventional banks. Hence, it is believed that *maqasid Shari'ah* shapes a critical influence on Islamic banks' performance as the Islamic banks' core business strives to offer the financial products and services that are *Shari'ah* compliance. Therefore, with the apparent relation between *maqasid Shari'ah* and Islamic banks, this study reviews the application of the *maqasid Shari'ah* explicitly relating to the development of performance measurements of Islamic banks.

2 Definition of Maqasid Shari'ah

The term *maqasid* is a plural word of the word *maqṣad* (singular) which literally means purpose, goal and objective [21]. Thus, the term *maqasid Shari'ah* means the purposes, goals or objectives of *Shari'ah*. Al-Ghazali states that the ultimate objective of *Shari'ah* encompasses the safeguarding these five cores which faith (*din*), self (*nafs*), intellect (*'aql*), posterity (*nasl*) and wealth (*mal*) that are considered as primary (*al-asliyyah*) in which others are referred as corollaries (*tabi'ah*) [21]. The omission of these five cores will bring harm to society. Al-Ghazali emphasizes the importance of preserving the *maqasid Shari'ah* as the fundamental meaning of *maslahah* [23]. Al-Shatibi further

interpreted the work of Al-Ghazali and classified it into three categories which are essential (*daruriyat*), complementary (*hajiyat*) and embellishment (*tahsiniyat*). The essential consists of those five elements: faith, life, intellect, posterity, and wealth that are regarded as necessary for the proper functioning of people's religious and ordinary affairs. The complementary complements the essential part whereby it is needed to alleviate the hardship and the embellishment refers to the those that lead to the refinement and perfection in the customs and conduct of people at all levels of achievement [24].

Meanwhile, according to Ibn Ashur, two general elements underlie *maqasid Shari'ah* which are the promotion of welfare (*jalb al-masalih*) and evasion of evil (*dar'a al-mafasid*) in which it clearly covers the promotion of welfare, combat against corruption, prudent usage of natural resources and enhancement of Islamic lifestyle [25]. Ibn Ashur's definition of *maqasid Shari'ah* foregathers the final objective of Islam whereby the benefits of individuals are guaranteed in the society that is guarded with the highest level of welfare [26]. Therefore, the authors further add those Islamic financial institutions, including Islamic banks, are supposed to be aligned with the *maqasid Shari'ah* as these institutions have idiosyncratic features such as elimination of interest, pursuance of public interest, nurturing economic well-being, promotion of social and economic justice and equitable distribution of income which are encompassed in the *maqasid Shari'ah* [26]. Abu Zahra extends the *maqasid Shari'ah* by including the components of education and justice and categorizes *maqasid Shariah* into three broader categories which are educating the individual (*Tahdhib al-Fard*), the establishment of justice (*Iqamah al- Adli*), and promotion of public interest (*al-Maslahah*) [27, 28, 29]. The promotion of public interest covers the components of complementary (*hajiyat*), necessity or essential (*daruriyat*) and embellishment (*tahsiniyat*) [26, 29].

3 *Maqasid Shari'ah*-based Performance Measurement and Islamic Banks

The previous research on Islamic banks' performance is still scarce and limited. Still, there is also a lack of studies investigating the elements of *maqasid Shari'ah* in the performance measurement of Islamic banks [21]. Moreover, none of the previous studies on the Islamic banking performance measurement combine both financial and religious aspects that are related to the characteristics of Islamic banks. Both performance measurement and the objective have a direct relationship; hence, *maqasid Shari'ah*-based performance measurement is essential in determining whether Islamic banks have achieved their ultimate objectives of *Shari'ah* [29].

A work of Mohammed et al. [27] pioneer the development of *maqasid Shari'ah*-based of performance measurement of Islamic banks named *maqasid* index (MI). Based on Abu Zahrah's theory of *maqasid Shari'ah*, the variables are assigned the weightage using Simple Additive Weighting based on three objectives: educating individuals, establishing justice, and promoting welfare, after the validation of items by the scholars. Their MI was further tested on the six selected banks from various countries. The findings showed that different banks perform highest in each of the seven performance ra-

tios, alternatives, and performance indicators, indicating the inconsistency of the individual Islamic bank's focus on the overall *Shari'ah* objectives. However, the MI does not consider the element of profitability and efficiency that are also imperative to measure the Islamic bank's financial performance.

Mohammed et al. [21] develop *Maqasid* based Performance Evaluation Model (MPEM) using the Al-Ghazali theory of *maqasid Shari'ah* and Ibnu Ashur's reinterpretation. Ibnu Ashur relates the interpretation of *maqasid* with the *masalih* or public interest. Al-Ghazali's framework focused on the human being as the subject of *maqasid*, which might not be applicable to an institution such as Islamic banks. Thus, the author adopts Ibnu Ashur's theory of *maqasid* for the interpretations and institutional elements that suit the MPEM. Al-Ghazali's dimensions of preservation of faith are synchronized with the element of freedom of faith, preservation of life is synchronized with the preservation of human dignity and protection of a human right, preservation of intellect is synchronized with the propagation of scientific thinking and avoidance of brain drain, preservation of progeny is synchronized with the family care, and lastly, preservation of wealth is synchronized with the elements of the well-being of society and minimizing income and wealth disparity, respectively. The appropriate ratios have been assigned to measure all those elements.

The past literature shows that the performance measurement index's development based on *maqasid Shari'ah* is developed following the same qualitative approach [28, 29, 34]. Using this approach first started with the literature review before proceeding with Sekaran's method of operationalization of the dimensions and elements. It is then followed by the finalizing and selecting the variables using the interview process with the expertise and concluded with a validation of the selected variables by focus group discussion. The development performance measurement based on *maqasid Shari'ah* by these studies [28, 29, 34] is still limited and only developed based on Abu Zahrah's and al-Ghazali's five components under necessity. The other two elements of *maqasid Shari'ah*, which are complements and embellishments, are yet explored by the researchers due to the problem of operationalization of the components [28].

Using the similar approach of Mohamed et al. [27], Hudaefi and Noordin [29] and Antonio et al. [30], Tarique et al. [28] proposed a more comprehensive *maqasid Shari'ah* performance index by covering the component of complements and embellishment in their *maqasid Shari'ah*-based performance measurement model for Islamic banks. Previously, Bedoui and Mansour [26] developed a *maqasid Shari'ah* based on the Pentagon-shaped scheme performance measurement scale. Their five-pillar Pentagon-shaped *maqasid Shari'ah* performance is based on Al-Ghazali's five cores: faith, intellect, posterity, wealth, and human self. Their Pentagon-shaped *maqasid Shari'ah* performance is more comprehensive because rather than focusing on profit maximization, the scale was developed comprising the objective of promoting and developing human welfare, preventing corruption, and improving social and economic stability.

Adopting the previous work of Mohammed et al. [27], Hudaefi and Noordin [29] enhanced the work of Mohammed et al. [27] by combining both religious and financial aspects in establishing the integrated *maqasid Shari'ah*-based performance measure (IMSPM). The financial performance measurements, which are non-performing loans,

return on assets, return on assets and operational efficiency, are included in the *maqasid Shari'ah* element of wealth.

Concerning the empirical evidence, several studies have tested the *maqasid Shari'ah* performance index. Mohammed and Taib [31] test the PMSS they have initially developed in Mohammed et al. [29] on the sample of 24 banks comprised of Islamic and conventional banks. Interestingly, they also compare those banks' performance with the conventional banking performance measures (CBPM) model, which consists of three ratios: return on assets, net interest income, and liquidity. Their finding shows that Islamic banks' performance supersedes conventional banks using the PMSS model compared to the CBPM model. The authors conclude that the assertion of Islamic banks' performance is left behind its conventional counterparts is not true and it happened because conventional measurement could not capture the objectives of the Islamic banks. This finding indicates that Islamic banks' performance should be measured using the right measurement that suits their nature of the operation and underlying philosophies underlies that is gearing toward the achievement of the *Shari'ah* objective.

Asutay and Harningtyas [32] measure the social performance of the Islamic banking and finance industry according to the three levels: banks, country, and industry level performance. Their study conceptualizes Najjar's view of *maqasid Shari'ah* on the sample of 13 Islamic banks from six countries for five years. Their findings show that Bank Syariah Mandiri and Indonesia score the highest at the bank and country levels even though the overall performance is unexceptional. The industry's orientation puts weightage according to the following self, faith and rights and stakeholding, followed by the wealth and social entity, intellect and posterity, and lastly, ecology. Besides, the findings of Rahman and Haron [33], specifically on the sample of Indonesian banks, based on the adaption of MPEM by Mohammed et al. [21], show that characteristics of the *Shari'ah* Supervisory Board and the structure of board have a significant influence on the *maqasid Shari'ah*-based performance during the period from 2012 to 2016. Consistent with the findings of Asutay and Harningtyas [32], the overall score of the *maqasid Shari'ah* index for Indonesian Islamic banks is still low, and most of the individual Islamic banks show fluctuating value. However, the findings of Antonio et al. [30] also prove that the *Maqasid* Index of Indonesian banks is higher than Islamic banks in Jordan. Using Mohammed et al. [27], Antonio et al. [30] concluded that no specific bank could represent a high index value.

Julia and Kasim [36] apply the *Maqasid Shari'ah* framework of Al-Ghazali in comparing the green performance of Islamic and conventional banks in Bangladesh. Their study found that none of the banks fully meet the green policy requirements. However, Islamic banks perform better in the preservation of faith, intellect, and wealth circulation. Mergaliyev et al. [37] also developed a comprehensive *Maqasid Shari'ah* Evaluation Framework to measure the determinants of Islamic banks' performance in light of *Maqasid Shari'ah*. Adapting the previous works of Bedoui and Mansour [26], Mohammed et al. [27] and Asutay and Harningtyas [32], this unweighted approach index has four primary objectives, which are invigoration the value of human life, human self, society and physical environment. Using the sample of panel data of 33 Islamic banks from nine years periods covering from 2008 to 2016, their findings show that Islamic banks in Jordan scored the highest average of the *maqasid Shari'ah* index, and *maqasid*

Shari'ah is influenced mainly by the political and socio-economic factors. The significance of political and socio-economic factors infers the importance of Islamic banks to adhere to the *Shari'ah* compliance in their activities to protect from deterioration their public image and reputational risk that might jeopardize the financial performance and stability of Islamic banks.

Al Mubarak and Osmani [38] analyze the Islamic banking products against the *maslahah* and *maqasid Shari'ah*. Their finding found that Islamic banking's products based on the *Bai Al-Inah*, *Bai Bithaman Ajil* and *Ijarah* sukuk are against *maqasid Shari'ah* and should be done detailed revision. On the other note, Rahman et al. [39] develop performance measures based on *maqasid Shari'ah* for the halal industry. Al-ziyadat and Ahmed [40] integrate *maqasid Shari'ah* with the "plan.do.check.and act" (PDCA) cycle in developing a framework to access the ethical aspects of Islamic financial operations. Combining Abu Zahrah and Al Ghazali's framework, Siddiqi et al. [35] formulate stakeholder well-being for the Islamic banking and finance industry. In view of the above literature review, Table 1 summarizes the main literature of the *maqasid Shari'ah*-based performance measurement of Islamic banks highlighted in this paper.

Table 1. A summary on the main literature of *maqasid Shari'ah*-based performance measurement of Islamic banks

Author	Basis	Dimension	Model
Mohammed et al. [27]	Abu Zahrah	<ul style="list-style-type: none"> • Educating individual • Establishing justice • Public interest 	<i>Maqasid</i> Indexes (MI)
Mohammed et al. [21]	Al-Ghazali and Ibnu Ashur's interpretation (public interest)	<ul style="list-style-type: none"> • Necessity element of <i>Maslahah</i> • Prevention of religion/faith • Preservation of life/soul • Protection of intellect/mind • Preservation of progeny • Preservation of wealth 	<i>Maqasid</i> based Performance Evaluation Model (MPEM)
Tarique et al. [28]	Al-Ghazali and Abu Zahrah	<ul style="list-style-type: none"> • Justice • Education 	<i>Maqasid Shari'ah</i> based performance measurement model

		<ul style="list-style-type: none"> • <i>Maslahah</i> (Necessity, complements and embellishments) 	
Hudaefi and Noordin [29]	Harmonization of the previous works of Khan (1997), Mohamed Ibrahim et al. (2004), Haniffa and Hudaib (2007), Mohammed et al. (2008), Asutay and Harningtyas (2015), Mohammed et al. (2015) and Jaffar and Manarvi (2011)	<ul style="list-style-type: none"> • Necessity element of <i>Maslahah</i> 	Integrated <i>maqasid Shari'ah</i> -based performance measure (IMSPM)
Mergaliyev et al. [37]	Mohammed et al. (2008), Bedoui and Mansour (2014) and Asutay and Harningtyas (2015)	<ul style="list-style-type: none"> • Invigoration the value of human life, human self, society and physical environment 	<i>Maqasid Shari'ah</i> Evaluation Framework

4 Conclusion

The purpose of this study is to review the past literature on the *maqasid Shari'ah*-based performance measurement of Islamic banks. It is found that the study on the *maqasid Shari'ah*-based performance measurement of Islamic banks is still scarce and limited. It can be concluded the previous research refers to the works of Al-Ghazali, Ibnu Ashur and Abu Zahrah in creating the dimension of the *maqasid Shari'ah*. The literature review shows that the work of Mohammed et al. [27] is the pioneer, still relevant, and in

fact becomes the basis of the subsequent empirical research on the *maqasid Shari'ah*-based performance measurement of Islamic banks. The existing empirical research of the *maqasid Shari'ah*-based performance measurement of Islamic banks is also dearth and still has ample room to be explored. However, this study still has limitations in a way that the selection of the studies only comprises the journals and proceedings and exposed to the bias from keywords used in Scopus and Google Scholar features search. This study focuses exclusively on the application of *maqasid Shari'ah*-based performance measurement in Islamic banks and provides insights to the researchers, academicians, practitioners, and regulators and policymakers in reviewing the development of the *maqasid Shari'ah*-based performance measurement of Islamic banks and its pathway of application in the empirical research. It is imperative for Islamic banking's industry players to align Islamic banks' objectives with *maqasid Shari'ah*-based performance measurement, and this paper addresses the literature gaps and serves as a guide for the future research related to this area.

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Internet Banking of Islamic Banks: Issues of Security and Privacy

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Abstract. This paper focuses on problems associated with the usage of internet banking and its privacy and security in the Islamic banks in area of Kota Bharu, a state capital of Kelantan which are attributed to the perspective, decision and suggestions from customers for possible actions that could be taken to overcome the problem. Today the online banking system is one of the services offered by the bank to the customer either by deposit or by the withdrawal of funds. In the ground of privacy security, there are several issues that may lead to the security of e-banking systems. This study is conducted utilizing qualitative methods to ensure the data analyzed through a reliable software package of ATLAS.ti. The data employed were drawn from interviews and documents analysis. Interview's data collected from online banking users in Kota Bharu, Kelantan. The contents and textual analyses also used to achieve this purpose. Researchers concluded that everybody now ends up making online payment transactions by using the technology at their fingertips. Researchers find perception factor to be crucially significant and play a key role in determining whether e-banking adherents are confident and content with the privacy and security of online banking and whether perceptions affect their choice of e-banking. To avoid problems concerning privacy and security, awareness is an essential element. In saving oneself from cybercrime, everybody has their own roles. Trusts also influence decision-making and perception in e-banking access. The implication of this study is that privacy and security are critical aspects in Islamic banking operation, and Islamic banking should take proactive measures to ensure that privacy and security in internet banking are at an optimal level.

Keywords: Internet Banking, Privacy and Security, Islamic Banking, Kota Bharu

1 Introduction

After nearly four decades of existence, Islamic banks have found out how to place themselves as money related organizations which are not only critical in asset assembly, asset distribution, and usage, but are also effectively associated with the path toward actualizing government monetary policy (Narayan & Phan, 2019). In addition to offering practical standard financial institutions, Islamic banks also promote domestic and international trade (Naushad, 2021).

Malaysia's Islamic financial framework is based on a dual or parallel financial system, a structure that enables interest-free and interest-based funding to co-exist for credits and funding (Poon, Chow, Ewers & Ramli, 2020). Furthermore, Poon et. al. (2020) stated that the multi-religious and multi-social features of Malaysia lead to the Islamic financial system's ability to manage conditions in which the demand for and supply of surplus funds are no longer entirely based on confidence, but also on various factors such as return on accessibility, deposits, and the cost of financing (Syarif, 2019). Furthermore, this religious and non-religious essential the showcase segment of Malaysian Islamic banking is accepted in a way that favors in the Malaysian Islamic banking investors' asset report the executive's organization influence execution (Naushad, 2021; Poon et. al., 2021).

Today, internet-based banking systems are one of the services offered by banks as a means for customers when making deposits or withdrawing funds. Computer-generated banks, also known as virtual banks or "branchless banks," are a new term used to describe banks that do not have a physical location, such as a branch, but instead provide services to customers through the internet and ATMs (Al-Shaer, 2021; Sadeghi, 2004).

Customers who use internet-based banking or online banking have direct access to a bank's information system from work, school, home, or any other location where a system association is available. The customer is now regarded as an end-client of the bank's information preparation structure in this contemporary paradigm. The customer's device plays an important role in end-client processing (Jiminez & Diaz, 2019; Gerrard, Cunningham & Devlin, 2006).

Al-Sharafi, Arshah, Herzallah & Abu-Shanab (2018) previously found that their findings affect the behavior of customers to accept online banking services with absolute trust. Furthermore, customer awareness, as well as perceived efficacy, security, and privacy, had a significant impact on their trust. Nevertheless, customers' perceived ease of use did not predict their intention to adopt mobile banking services.

Raza, Umer, Qureshi and Dahri (2020) and Normalini and Ramayah (2017) provide tools to assess the viability of biometric authentication technology in internet banking. While counting user perceptions of the effectiveness of biometrics authentication technologies in the framework's experimental testing, fundamental insights into the dynamics of the relationship between trust and its backgrounds were revealed. The findings of this study, in general, highlight the importance of using biometrics technology in internet banking. The relationships between perceived privacy and security and trust were clearly qualified by the perceived effectiveness of biometrics technology.

Numerous researchers are already conducting research in this field, but the majority of these studies focus exclusively on conventional banking in Malaysia. Researchers rarely pay attention to research on the internet banking system provided by Islamic banking. As a matter of fact, the purpose of this research is to investigate adopters' perceptions of Islamic banks' e-banking in Kota Bharu in contexts of privacy and security. To determine whether adopters' decisions to use e-banking are adversely affected by the potential ramifications of e-banking, and ultimately to determine what measures can be taken to resolve e-banking privacy and security concerns (Raza, et. al., 2020; Yussaivi, Lu, Syarief & Suhartanto, 2021)

2 Literature Review

Islamic banking has become more recognized among market participants during the last decade. This is because technology has improved Islamic banking system performance for better services. In Saudi Arabia mobile services are easily accessible to users according to Alsheik & Bojei (2014). Alongside its expansion, a range of concerns in technology has been recognized. These problems include insufficient technological experience, inadequate use of technology and awareness of the risks involved (Wijayati & Gustyana, 2021).

According to Eklof et. al. (2016), the Islamic banking sector in Pakistan is dominated by shariah compliance understandings, which play a significant role in customer satisfaction. In the Muslim country, both the company's product and services must fulfill Islamic law since it is the most important preference among the customers. Customers will seek out Shariah-compliant institutions to use and purchase their goods and services, as this will provide them with satisfaction in selecting the best institution.

Customers' views are favorably linked to their quality preferences (Wall et. al., 2018). Perception is a common thing that naturally occurs when it is related to humans dealing with something that will result in good or bad outcomes. Especially when the person is about to decide whether to use, apply, or adopt it. It is an active process that requires information processing and then interpreting it into a message to give humans an idea of how individuals perceive something.

Paul et al. (2016) viewed perception of a product's performance will emerge from the comparisons process, wherein the perceived performance of one company is compared to the other perceived performance of another company. Then, with one or more of the other company's standards compared, an expectation will be created. In brief, customers' perceptions of services in the internet banking industry would have a significant impact on the company.

Besides, Mohammadi (2015) found that awareness has an impact on users' perceptions in Iran. On the other hand, Dixit et. al. (2010) analyzed the aspects that have an impact on the use of internet banking services that are surrounded by consumers and show the degree of consideration regarding privacy and security issues in India. Meanwhile, Safeena (2011) observed that awareness of internet banking services was high in their study. As a result, awareness has a significant impact on the adoption of internet banking services and customer satisfaction.

In a study of Aghdaie et. al. (2011), trust can be classified into two types: interpersonal trust and institutional trust. The former is established between online customers and merchants, while the latter is established between the computer and the consumer. The client's assertion that she or he could have relied on electronic banking to ensure the welfare and security of the client's online transactions was referred to as trust (Al-Dmour, Al-Dmour, Brghuti & Al-Dmour, 2021; Holsapple & Sasidharan, 2005).

Riek (2015) demarcated cybercrime as an unavoidable threat in today's Internet-dependent society. Though the true scale and economic impact are difficult to quantify, officials and scientists agree that cybercrime is a massive and growing issue. While according to Gaol, Budiansa, Weniko and Matsuo (2021) and Broadhurst (2014), cybercrime is typically defined as a criminal activity involving technologies and computers committed on the internet. Contrary to More et. al. (2016), cybercrime is an intentional attack from one computer to another computer by using network to modify, disrupt, repudiate, degrade, or damage or destroy the data accommodated in the attacked system or network.

2.1 Research Framework

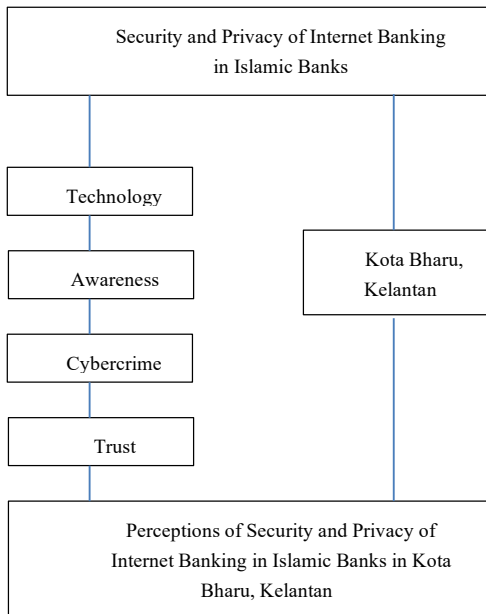


Fig.1. Research framework of perceptions of security and privacy of internet banking in Islamic banks in Kota Bharu, Kelantan

The research framework in Fig. 1 can be defined based on the themes and research gap that have already been identified. According to Fig. 1, the themes identified in the literature review regarding internet banking security and privacy in Islamic Banks are technology, awareness, cybercrime, and trust. Meanwhile, the study was conducted in Kota Bharu, Kelantan. As such, this study will examine customer perceptions of internet banking security and privacy in Islamic banks in Kota Bharu, Kelantan.

3 Method

3.1 Research Design

A research design is a plan that specifies when, where, and how information will be collected and analyzed (Parahoo, 2014). The research design is referred to the framework within which a researcher chooses his or her research methods and techniques (Schoonenboom & Johnson, 2017). The design enables researchers to focus on research methods that are appropriate for the subject matter and to establish a foundation for

success in their studies (Novikov & Novikov, 2019). Since this purpose of this study is to identify adopters' perceptions, analyze customers' decisions in choosing Islamic bank e-banking, and conclude possible actions to overcome privacy and security issues among e-banking users in Kota Bharu, Kelantan, qualitative research is appropriate for this research.

3.2 Qualitative Research

The qualitative method is used to collect data in this study. Aspers and Corte (2019) stated that qualitative research is guided by intense and delayed contact with a "field" or life circumstance. These situations are frequently "cliché" or typical, intelligent of individuals', groups', societies', and organizations' regular day-to-day lives.

Qualitative research is done in the same way as exploratory experiments are done (Crawford, 2006). Likewise, Yilmaz (2013) has expressed a quality research approach to examine people, phenomena, social, cases and processes in their natural state in a natural, naturalistic, inductive and interpretative way to reveal in a descriptive aspect of the relevance of their experience in the globalized era.

The aim of using a qualitative approach in this study was to investigate and portray the perceptions of online banking users in Kota Bharu, Kelantan, on privacy and security in internet banking particularly in Islamic banks. It was an effective method for gathering their thoughts on the effects of internet banking in terms of its privacy and security. The methods used were as follows:

Exploratory Research

Pantano and Vannucci (2019) states that when another area is researched or when little is known about the area of interest exploratory examinations are carried out. It is used to investigate the full concept of the phenomenon and the various factors associated with that too. An interview was used in this study to examine the perceptions of internet banking users in Kota Bahru, Kelantan, on the privacy and security of internet banking. Even though this paper has focused on the privacy and security of internet banking, little is known about the perceptions of online banking users toward Islamic banking in Kelantan.

Descriptive Research

Gupta, Chauhan and Jaiswal (2019) defined descriptive research as a design for providing a picture of the natural environment. It explains the current practice and concludes with the development of theories. According to Creswell and Clark (2017), researchers need to select respondents and research sites purposely in order to conduct a thorough review of a phenomenon. This study aimed to obtain a picture of the perception of

Internet banking users on privacy and internet banking security to improve the security of internet banking. In the context of this study, descriptive research is used.

Interview

According to Willis (2019), a qualitative research interview seeks to cover both accuracy and significance levels, but it is typically increasingly difficult to interview on a meeting level. He explained that the interview on qualitative research looks at the implications of focus topics in the universe of existence of the subjects. The main task of the interview is to understand the importance of what the interviewees say. The purpose of this study is to examine further the privacy and security of internet banking among customers of electronic banking in Kota Bharu, Kelantan.

The respondents for this study consisting of twelve online banking users with a variety of backgrounds. These twelve respondents are taking into account the data saturation as the point when no new information or themes are observed in the data. They came from a variety of backgrounds such as professionals, government servants, university students, managers, retailers and entrepreneurs. This survey inquiries about their familiarity with online banking, how do they know about e-banking, do they know what privacy and security of online banking entails, do they believe online banking is secure and essential in the future, then how does the privacy and security e-banking level of Islamic banks in Kota Bharu affect customers' decision to adopt internet banking.

3.3 Data Collection Method

In this qualitative analysis, data was collected using two methods. Primary data collected through a research survey, which is a personal interview, and secondary data gathered through document analysis of books, journals, conference papers and newspapers.

Primary data

This study was based on primary data collected through a series of qualitative interviews with twelve informants consisting of customers who consistently using internet banking in Islamic banks available in Kota Bharu.

The ordained gave researchers and respondents an insightful discussion to communicate and understand one another. This allowed the researcher to extract relevant data that would have been impossible to obtain through a standardized questionnaire. The personal interviews also allowed the researcher to meet the respondents face - to - face, thus allowing them to evaluate their expression during the talks.

The first source of data is primary data. The original data were collected to answer questions from the research. The researchers themselves are collecting information to test the hypothesis in their study. This file is not available. Then, the data sources are

generally collected via experiments or field research. Interviews and observations are an example. It can be compiled of people, focus groups or expert panels. In principle, the collection of passive and active data is based on two primary methods of data collection (Nguyen, 2019).

The rationale for the interview is to explore the perspectives, meetings, beliefs, or inspiration of individuals on specific issues. Until an interview, informants should be informed about the test points of interest and provide confirmation of moral standards (Devlin & Gray, 2007).

The researcher only chose internet banking customers in Kelantan in this study. The rationale is that the researcher has decided to collect the best and the most numerous replies to complete this research. The researchers have carried out a semi-structural interview as respondents answer the researchers' questions spontaneously. On top of that, researchers also use communication face-to-face to ensure the information is pure.

Secondary Data

Secondary data is information derived from previous studies. These data differ from primary data, in which the investigator collects the data himself or herself from an interview. Secondary data too are reliable in support of every researcher's research. Secondary data also support large-group research, since data from various sources can be collected (Ritchie, 2013).

The information or derivative material gathered by the individual or other researchers. Reviewing a book, journal, conference paper, or newspaper, for example, is an example of secondary data. Journals from databases and academic textbooks such as Emerald, ProQuest, Science Direct, Google Scholar, My Athens, Research Gateway, and Yahoo were used as secondary data in this study.

Secondary data is gathered by the researcher from journals, newspapers, and books. Secondary data is used by researchers to take a data or reference that is related to Islamic banking knowledge. This is due to research indicating that privacy and security are very important in modern digital age.

3.4 Data Analysis Method

To ensure the validity of the information examined in an effective manner, the data collected in the study are analyzed using document analysis and supported by the ATLAS.ti software program. The data for this study gathered using existing resources such as books, articles, and journals. Therefore, ATLAS.ti also was adopted to retrieve data from interviews.

Interview

Interviews are a method that requires subjects and researchers to participate to acquire and collect information. Researchers obtained the information studied directly from direct sources. Any information gathered during the interview must be documented because any responses mentioned by respondents are important data to observe and analyses. According to Willis (2019), the interview method was preferable to the questionnaire method for gathering in-depth data. Interviews can be part of the overall research data collection strategy or one of the techniques used in the study.

Documentation Analysis

Documentation analysis is a type of qualitative research in which the analyst examines documents to identify an appraisal theme. Document analysis is a social research method and an important research tool as it is used in most triangular schemes, which are a combination of methodologies used to study the same phenomenon (Bowen, 2009). Documentation review is a form of secondary data analysis.

Document analysis is used by researchers for a variety of reasons. This is because documentation analysis is one of the most efficient and effective methods of data collection because documents can be handled and obtained from practical sources. When conducting research or experiment, obtaining and analyzing documents is frequently more efficient (Bowen, 2009).

ATLAS.ti version 8 is a powerful workbench for analyzing large amounts of textual, graphical, audio, and video data. Sophisticated tools assist researchers in creatively arranging, reassembling, and managing researcher material. This version 8 maintains the researcher's focus on the material itself. Hence, it meets the needs of researchers for qualitative analysis.

3.5 Validity and Reliability

The concepts of validity and reliability were also used in this study. It is to understand how to minimize the possibility of errors and tendencies by increasing the data's reliability and validity. According to Patton (1994), reliability is one of two factors that qualitative researchers must consider when conducting the study, analysing the results, and evaluating the study's quality. Furthermore, Seale (1999) suggested that creating a good quality study through credibility and validity in qualitative research, as further claimed, "belief of a research report lies in the middle of issues commonly discussed as validity and reliability."

Conferring to FitzPatrick (2019), validity evolved into a complicated concept. It is more closely related to the conclusion based on the assessment results. That is more

focused on the outcome of the speculation that makes it implied. This evaluating consideration must be accurate and declare the truth. The assessment or evaluation should not be valid; only the assumption about this evaluation should be valid.

4 Findings and Discussion

Based on the findings attained, this study concluded five factors that may stimulate the issue of privacy and security in e-banking are Technology (1), Perception (2), Awareness (3), Trust (4), Cybercrime (5). The findings can be illustrated from network view of ATLAS.ti and the explanation of the findings are as follows:

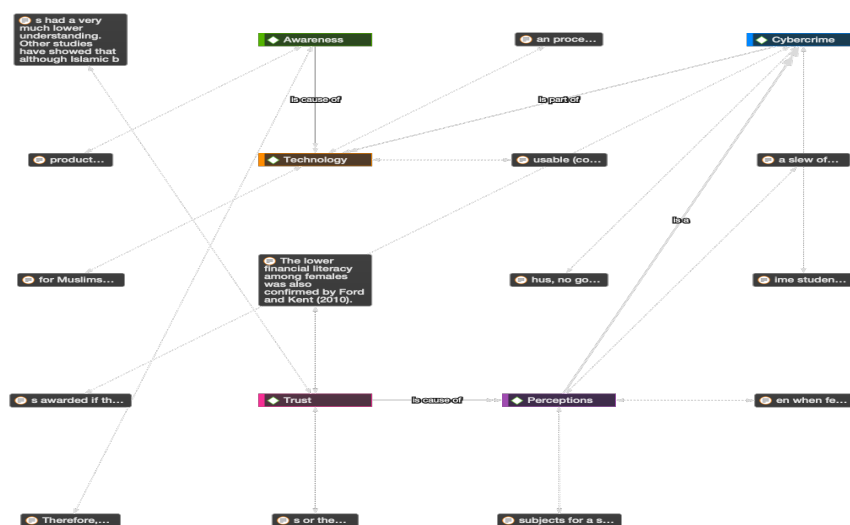


Fig. 2. Network view of perceptions of security and privacy of internet banking in Islamic banks in Kota Bharu, Kelantan

4.1 Technology

Every respondent believed that technology played a significant role in their decision to work in Islamic banking. They acknowledged that Islamic banking, in the absence of technology, will struggle to compete with conventional banking. Additionally, with the advancement of technology in banking, it simplifies banking-related transactions for them.

This view is found to be parallel to Utami and De Guzman (2020). They said that the business process in financial services is incredibly challenging. Banks must introduce alternative delivery channels to attract online users and enhance consumer perception. Most banks have already implemented online banking by providing their customers with a variety of online services that provide greater access to information and transactions. Customers' satisfaction is becoming imperative as a success factor in e-banking. In a service organization, technologies are rapidly being developed. It aims to improve the quality of customer service and delivery while also reducing costs and standardizing core service offerings (Ibrahim et al., 2006).

However, respondents 1, 3, 4, 6, 7, 9 and 12 expressed some concern about whether the technology would also result in concerns about the security and privacy of their banking data. They are concerned about the ease with which irresponsible parties can obtain their personal information. Additionally, the growing problem of scammers heightens their concerns about the security and privacy of online banking. Additionally, banking data hacking incidents have occurred in Malaysia, compounding their concerns.

4.2 Awareness

The majority of respondents stated that they were extremely conscientious about safeguarding personal banking information such as their username, pin number and password. For example, according to respondent 4 stated that:

“Along with my credit card and debit card, I did not preserve the password number and pin number in my wallet. This is due to the fact that it is extremely hazardous. In this regard, I will use extreme caution.

I will not respond to mails from scammers because I am aware that they are really harmful. They can deceive you in a number of ways.”

Additionally, they are familiar with banking fraud, such as the Macau scammer. This awareness is in line with Tan and Teo (2000) that identify three aspects of consumer behavior that demonstrate consumer awareness of e-banking, as well as subjective norms. Which exemplifies the social impact that can influence the customer's motivations for using Internet banking and, ultimately, recognizing in control of behavior, which explains the anticipation of adapting mobile banking. Awareness is a critical component in preventing problems with privacy and security issues. Both customers and banks must play their roles to stay alert and spreading awareness to the public (Mathiyarasan & Chitra, 2019). Everyone has a role of socially responsible in preventing themselves from becoming a victim of cybercrime.

4.3 Trust

According to Yuusaivi et. al. (2021) and Bhattacharya et al. (1998), researchers from various disciplines have hypothesized trust along various dimensions. Identity analysts usually describe trust as an individual trademark, whereas social therapists generally view trust from the perspective of behavioral desires for others involved in transactions. Economists and sociologists generally focus on how institutions are set up and impetuses are used to reduce vulnerability associated with transactions involving relative outsiders. It has been demonstrated that trust is a critical middle person in all business relationships and should be a central focus of any organization associated with administrations (Al-Dmour et. al., 2021; Morgan & Hunt, 1994). This is parallel to

“Trust plays a significant part in maintaining clients trusting the bank.”

Whereas respondent 6 stated that:

“We have no trouble doing business with banks and remaining loyal to them if they can maintain an element of confidence throughout their operations.”

4.4 Cybercrime

Cybercrime is commonly defined as a criminal activity involving technology and computers that takes place on the internet. Mogos and Jamail (2021) and Riek et al. (2015) also demonstrated that cybercrime has a significant impact on operational systems in banks. Cybercrime has a wide range of consequences including financial costs and intangible losses. Some cybercrime involves criminals assuming specialized roles and deceiving people. Respondent 2, 6, 9 and 10 stressed that:

“We are particularly worried about recent cybercrime issues, and we propose that the Malaysian government take decisive measures to combat this critical problem. We, as customers, are quite concerned about the current rise in cybercrime.”

Whereas respondent 3, 4, 7 and 10 stated that:

“We always take the best precautions to avoid being tricked by cybercriminals; we also propose that the bank take stricter efforts to ensure that customer information is safe and secure; the bank is also required not to sell our information to irresponsible third parties.”

In addition, these cybercrime attacks are designed to steal relevant information, money, and other valuable information while leaving no trace of the intrusion (Acharya & Joshi, 2020; Gaol, et. al., 2021).

5 Conclusion

The primary goal of this research is to investigate and investigate adopters' perceptions of Islamic bank e-banking in Kota Bharu in terms of privacy and security. From the findings, it is suggested that there are several factors to take into consideration, and it is the responsibility of banks to ensure that customers are provided with secure systems to use e-banking services, as well as to spread awareness to the customers. Not only that, e-banking users must take personal responsibility to avoid becoming a victim by being aware of and always cautious of any issues or problems related to the privacy and security of the e-banking system.

Users of online banking are acknowledged of the tremendous benefits gained such as convenience, twenty-four-hour availability, time savings, and the ease of conducting transactions anywhere. These are some of the most important advantages of internet banking that users have mentioned. Based on the result attained, privacy and security issues have become a concern to the adopters, not just those who have experienced cybercrime but also those who are not.

According to the study's findings, users are concerned about privacy and security issues, not just those who have experienced cybercrime but also those who have not. As a result, the researcher discovered that perception is very valuable and plays a key role for users who are determined to adopt internet banking. Consequently, their trust and awareness of internet banking, as well as their perception of online banking privacy and security may influence their decision to act. Finally, users of e-banking must be responsible for securing their personal information, and organizations must strengthen their proxy from hackers breaking into operational systems.

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Union 5G

From E-Pandemic Management to the EU's Digital Overhaul

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Abstract. In this paper, global E-Pandemic Management is seen as an opportunity to advance digitalization in the EU (European Union) in all areas, such as E-Education, E-Health, E-Administration, E-Climate Protection, or E-Economy. For a functioning E-Pandemic Management, the digitalization of the affected states, i.e. the process-controlled use of IT (Information Technology) in all areas, is virtually a prerequisite. Therefore, we can also talk about IT-supported pandemic management or IT-supported education instead of talking about E-Pandemic Management or E-Education. We will explain E-Pandemic Management using a directed process for the execution of digitalization projects, which is divided into the sections Motivation, Basics, Modeling, Tool Support, Solution, Usage, and Summary with Outlook. The overarching motto here is that the digital world induces and monitors the analog world. Digitization has the primary effect of making people's lives in the analog world more accurate through process-centric modeling and more secure, because it is now also supported from the digital world by the models (schemas) that have been implemented. However, this holistic approach is only physical possible in the analog world based on a hybrid cloud computing architecture and the 5G mobile communications standard that has already been installed in many places.

Keywords. Pandemic Management · Cloud Computing · Cloud Platform · 5G Standard · Repository System

1 Motivation

On March 11, 2020, the WHO (World Health Organization) declares a worldwide pandemic due to the rapid spread of the Coronavirus. This has the consequence that in almost all countries very far-reaching measures are enforced in the public and private sector, which represent a high restriction of the previously accustomed life [30]. These

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measures such as contact restrictions, curfews and quarantine orders, fall under the so-called pandemic and contact management, which are among the most important methods for getting a pandemic under control and restoring normal life [17]. Besides, there are digital or IT-based solutions, such as the Corona Tracing App or the RKI's (Robert Koch-Institute) Data Donation App, which are designed to support Pandemic Management digitally [1, 27]. For optimal pandemic response, all stakeholders should work together efficiently, which in reality looks different. The pandemic represents a worldwide phenomenon - but the handling and management of it are handled in a highly differentiated manner: different political approaches, different process-oriented approaches, as well as different IT-supported approaches, exist [9]. Even at the national level, there is no consensus. There is a lack of uniform digitization and a consistent system that allows all-encompassing networking [28]. This fact poses a real problem for efficient pandemic control and indicates that progress can only be achieved by taking the next step of digitalization. Besides E-Pandemic Management itself, the application domains of E-Education, E-Health and E-Economy are also affected, to which E-Pandemic Management can be subordinated [12]. The goal is to use a hybrid cloud computing-based platform solution to circumvent the problems mentioned and to enable optimized and digital pandemic management from the cloud using interactive application systems. Moreover, it is a generic solution that is not limited to the current pandemic and can be extended and used in the future. Finally, it is also important to note that the development and achievement must be guided by the "language critical EU digitization" guardrails: Process-driven interactive application systems as a contemporary application system type, an integrative architecture to support the analog through the digital world, and language-competent citizens empowered to communicate and cooperate in a language-critical, IT-supported manner, which is made possible by language-based informatics and the existing method of language criticism [21, 22].

2 Basics

For a better understanding and an easier classification of the topic in the overall context, the most necessary basics are briefly conveyed within this chapter. The chapter is divided into the technical (digital world) and expert (analog world) areas. Thus the actual target functionality becomes recognizable: The digital world causes and supervises the analog world via interactive application systems [21, 22]. The digital world follows the laws of formal logic and thus the laws of "being true" according to Frege. While the analog world is based on the laws of nature and empiricism and often also on the laws of "accept true" (belief, opinion, knowledge) [23].

2.1 Expert area

Here, as described, the professionally relevant basics of the analog world are presented.

Pandemic. A pandemic is a disease that, compared to other diseases, spreads very quickly over wide areas, such as countries and continents. In the worst case, a pandemic can lead to the disintegration of the functioning of all public and private structures, to an overload and thus to high death rates among the population. To avoid such proportions, it is essential to develop appropriate planning and preparation for such situations [26, 31].

Pandemic Management. To be able to control a pandemic, sophisticated management is required: the pandemic management. The goal is to ensure the functioning and maintenance of public functions, companies, the structure of society and essential structures in the event of a pandemic or crisis. Overall, well-thought-out pandemic management should be divided into different phases. The behavior between pandemics as well as before, during and after a pandemic must be planned. A particularly important component in this context is contact person management, in which contact persons (those who have come into contact with the disease) are to be managed [14].

E-Pandemic Management. According to Götz, the term E-Pandemic Management is understood to mean an "IT-supported application that performs tasks relating to the preview and planning, organization, management, coordination or control of a pandemic [...]" [12]. At the same time, following Götz, the term is subordinated to E-Economy and E-Education, which in turn are subordinated to E-Health. E-Pandemic Management is thus also the context to be digitized. To achieve the target function the prerequisite is optimal process-centric digitization, i.e. IT use here, in the entire area - E-Pandemic Management, E-Health, E-Education, E-Economy [12].

Stakeholders. Various stakeholders are involved in pandemic management. For a simplified understanding, the following **Fig. 1.** Parties involved in Pandemic Management illustrates their interrelationship. These include the health authorities, which are primarily responsible for contact person management [11], the government, which acts as coordinator and regulator [4], but also the media and social networks play a decisive role in terms of information and knowledge management. Not to be neglected are also the citizens themselves, who have a very great responsibility during a pandemic and must behave within society in a manner appropriate to the situation [8, 13].

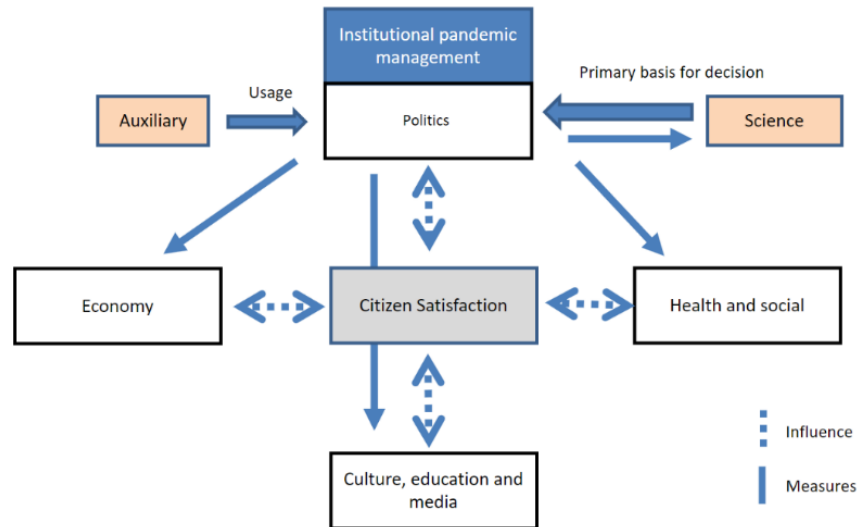


Fig. 1. Parties involved in Pandemic Management

2.2 Technical

Here, the technically relevant basics of the digital world are presented as described.

Cloud. The term "cloud" refers to a potentially worldwide network. A cloud does not represent a physical size, but rather a digital ecosystem consisting of remote servers, which can be distributed all over the world. These make various tasks possible, as is also the case with classic structures: data storage, data management or the provision of services. In principle, the different approaches to the topic of cloud must be mentioned: the public, private, hybrid and community cloud. These types differ mainly in the extent to which persons or institutions can/are allowed to access the services of the respective cloud [3, 18].

Cloud Computing. The term cloud computing refers to this collection of services, applications or resources that are available to all users simply, flexibly and at low cost - in short, a repository. Besides, it is not necessary to have IT expertise to use such offerings. The provider is responsible for operation and maintenance, and the user merely pays a usage fee [25].

Cloud Platform. A cloud platform is nothing more than a Repository System in the cloud, which is a directory of services etc. A user can see which services can be executed via the platform, but not how they work, which is not necessary for principle [3].

5G Standard. The term 5G refers to the latest generation of mobile communications standards, which is establishing itself worldwide as the standard for the mobile Internet - during a great deal of competition (political, technological, ecological, etc.). At the same time the 5G network represents a successor to the existing 4G standard. The advancing expansion of the new standard will enable a wide variety of areas of life to benefit further from digitalization. Since data exchange is faster than with LTE, a much faster exchange of data is being pushed [19, 24].

3 Modeling

The beginnings of modeling can be found in different subfields (e.g. databases and programming) of computer science. Here, the decisive question is about the content, formal and technical meaning of the data. "In this context, data are statements about information objects and their properties based on concepts." [20] In the context of modeling, processes are modeled in this case with BPMN 2.0 diagrams, as directed sequences of an occurrence [23]. Especially since this is possible in different modeling domains. In the context of pandemic management different processes of the overall process were considered for this purpose. It is particularly important to mention that a modeling approach established by Volker Stiehl [29] according to the Process-driven Architecture is chosen at this point: first, the domain-oriented expert-view of processes is modeled (which is done in this chapter). In Chapter 5, the solution, the technically relevant view is then focused on.

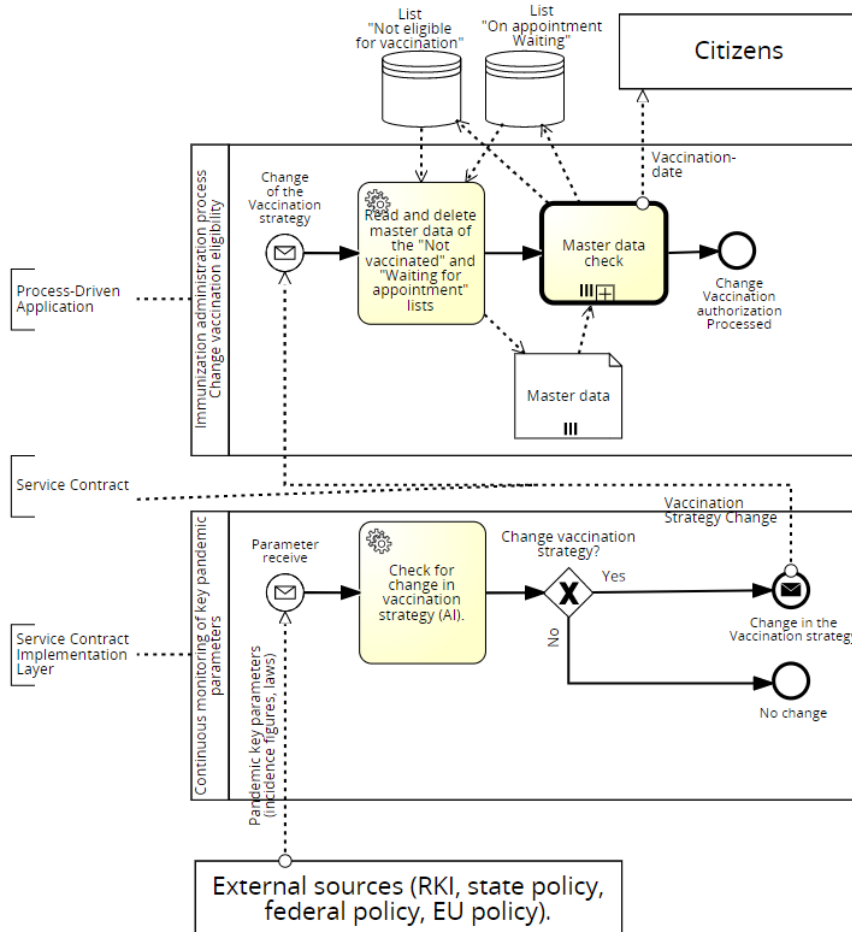


Fig. 2. Business Process of an immunization administration

The upper process (Fig. 2) shows the domain-specific business process of an immunization administration. If a change in the vaccination strategy takes place, the citizens managed in two lists (one list for citizens who were not eligible for vaccination according to the old vaccination strategy and a second list with citizens waiting for an appointment) must be checked again for vaccination eligibility according to the new strategy. The verification is performed per citizen according to the new vaccination strategy and, depending on the verification result, results in the dispatch of a vaccination appointment, entry in the list of waiting citizens or in the list of non-vaccination-eligible citizens. To accomplish its task, the process relies on notification of an immunization strategy change, as indicated in the model by the service contract. Through the service contract, process-driven applications express their requirements for services to be provided

externally. How this contract is implemented in concrete terms is not of interest to the process of the process-driven application and is part of the technical implementation of Chapter 5.

Besides, the same approach was followed for the following basic pandemic management processes: Suspicion of contact, suspicion when symptoms are present, data monitoring by the health department and statistical use of anonymous aggregated data.

4 Tool support

By the realization of different analog-digital converters (e.g. first electron tube by Konrad Zuse) the time of computer science begins and finds a provisional end utilizing an optimal software architecture (e.g. the language-stepped multi-purpose architecture, i. A. Gottlob Frege), which was specified and regulates the transition in a contradiction-free way between the analog and digital world, language-logically [23]. The analog-digital converter in technology corresponds to the emotion-speech act converter in humans. What electronic chips are in technology, concepts are in humans [10]. The function of the chips in technology is taken over in humans by the concepts, more precisely: their physical representation, the cells, in the brains. Human-centered symbol manipulation, researched according to Ernst Cassirer [5–7], is the basis for a new language pedagogy that ensures a more understanding interaction of users with information technology (e.g. smartphones, computers). In the future, all further developments should be based on this basic architecture (**Fig. 3**) and interdisciplinary, with the basis of a philosophy of science [15] that is IT-supported, leading to ever newer results in research, which will enter in ever better IT-supported application solutions. These are then mostly interactive application systems that want to satisfy the Turing ideal and at the same time, on the human side, assume free speech acts according to Ernst Cassirer "Animal symbolicum" as the basis of reasoning [5–7]. The multi-purpose architecture mentioned is illustrated in the following **Fig. 3** for the domain of E-Pandemic Management. As mentioned, this architecture can be applied to a wide variety of domains; E-Pandemic Management can easily be replaced by other domains (e.g. E-Climate Management).

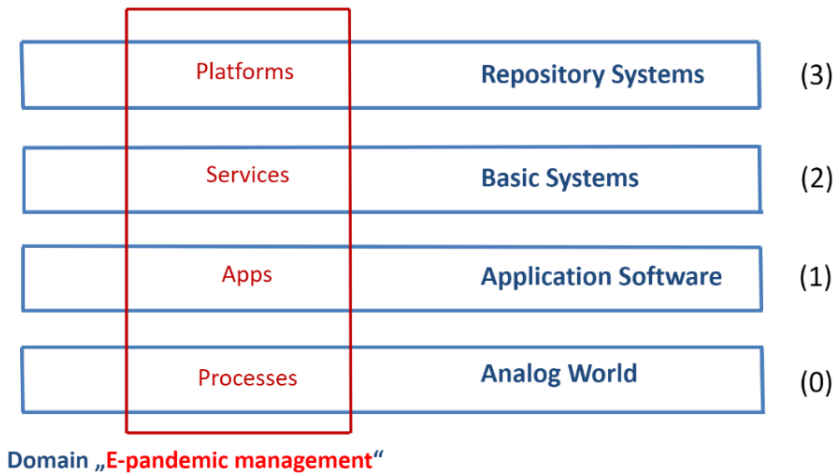


Fig. 3. Integrative General Purpose Architecture [23]

Especially in this context of E-Pandemic Management, different tools are used, which in turn can be classified in the architecture. The chapter is mainly based on cloud computing technology, using the Google Cloud Platform as an example, from which a wide variety of services and technologies are used in this context.

Cloud Computing. To enable a more efficient data flow for pandemic management, it seems sensible to establish a cloud platform that enables and partially takes over the management and processing of the data. In this context, the deployment options (private, public, hybrid, community, etc.) must be considered and used in a targeted manner. In the case of Pandemic Management, a hybrid cloud solution is particularly useful: For example, it may make sense for each office to have its private cloud to organize the administration, but for the offices to be connected to form a community cloud to enable the entire pandemic management between the actors via the cloud. At the same time, the users must also be able to participate in the system, which means that there must also be a public cloud aspect so that appropriate interaction by the citizen can take place. Also, a wide variety of services should be considered, which further leads to increase efficiency. Google offers a total of over a hundred services in various categories, from storage to networking, big data and security [2].

Mobile application based on a user repository. With the help of an interactive application system, which is also based on a repository-supported architecture that is used by citizens, the offices are supported in contact tracking with the help of a digital approach. The focus is on the user and their ability to manage their identity and the data themselves. The user is also offered further opportunities to contribute directly to efficient contact management in a digital way (e.g. in the form of digital diaries that can be automatically forwarded to offices) [12].

Progressive Webapp. A progressive web app also represents one of the mentioned interfaces to the cloud. Especially for the stakeholders such as the health departments, physicians, laboratories and other institutions, it makes sense to use the web interface, since here often also several information from the cloud must be displayed or fed at once. Through this web-based interface, the basic interaction with the cloud platform is made possible for the various user groups [16].

5 Solution

This chapter presents a potential solution approach based on the previous expert modeling and tool support to create a cloud computing-based solution for E-Pandemic Management. The focus is on the implementation using the service contract implementation layer of the process-driven architecture. The solution corresponds to the integrative BPMN schema, which includes the technical layer [29].

The service of notification of a change in vaccination strategy expected in the business process of the process-driven application and described via the service contract must now be implemented in concrete terms, which is why this level (see **Fig. 2**) is referred to as the service contract implementation layer. This layer now takes over the coordination of external information sources and evaluates this information, e.g., using artificial intelligence. If this evaluation results in an urgently required change of strategy, this is indicated via a message to the process-driven application. The service contract implementation layer thus fulfills the required service contract.

As already described in the modeling chapter this step was also carried out for the remaining processes. The digitization of further processes relating to the pandemic will also affect other e-areas. An E-EU can gradually be achieved in this way. As explained at the beginning Corona is a worldwide pandemic, which means that pandemic management is also required worldwide [9, 29]. As in Germany, there are different approaches to this management. This makes it clear that it may make sense to scale the concept developed here further and not just to manage it at the federal or national level, but ultimately to expand it nationally or even internationally. As the following **Fig. 4** shows, the processes at lower levels flow into the processes at higher levels. To approach digitization in a solution-oriented manner the principle of top-down coordination/bottom-up development should be followed [21, 22]. The concept presented should therefore be coordinated from the top, but developed by lower levels and then scaled up. Digitalization based on the cloud platform in particular can open up the possibility of integrating many countries into the system. Since resources and services are used entirely from the cloud, upscaling is possible without any other difficulties.

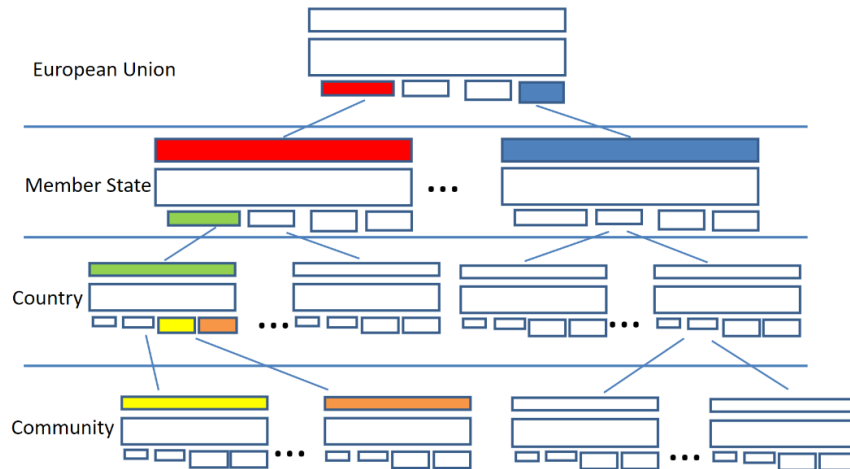


Fig. 4. New EU – through-digitized [14]

Furthermore, the presented approach enables a special degree of user-orientation. Since in the foreseeable future humans (regardless of their age or IQ (Intelligence Quotient)) will in all likelihood no longer forget anything crucial and will always be provided with the highest quality knowledge for making decisions or performing actions, regardless of when or where they need it, an adequate tool is also required here. Thus, an approach is delivered with which people can manage their schemata and their knowledge better and convert them into actions [23].

6 Usage

Especially in the 21st century, data represent a huge potential and can even be considered the "oil of the century". However, it is important here that schemes for interpreting this "raw material" - knowledge and information management thus play an important role [23]. It is often the case that we cannot do anything with the knowledge we have and it is difficult to distinguish whether we believe, mean or know something. Just the use of knowledge must be coordinated by appropriate management concerning the use in a community for the achievement of progress. At the current time, we have a wide variety of apps and services available to support us in this (e.g. Blinkist or Wikipedia). The goal must be to constantly adapt the schemata of our reality orientation - dialogically if possible - to changing circumstances. Ideally, this adaptation should be co-acted by different scientific disciplines, since schemata only represent the language-logical supports in an analogous world. Through this background also the use in this context and its data should be represented. For decades, the function of information and knowledge management has been assumed by so-called Chief Information Officers in companies and the state.

7 Summary with outlook

The concept of cloud computing supported pandemic management described in this paper has the potential to address the problems mentioned at the beginning and enable more efficient management of pandemics that require contact tracking. A language-critical digitization and education of users to use languages in a disciplined manner as a condition emerges, bring all the components described closer together. With renewed reference to the guardrails of EU digitization, the educational level of the population and its language competence is supported by technology. In this context, digitization represents the logic-based part of enlightenment. At the same time a multi-purpose software architecture between the digital world (cloud computing) and the analog world processes has to be built and interactive application systems developed according to the Volker-Stiehl method have to be established. The digital world thus supports the described things and events from the analog world using the formal-logical laws. Digitization in itself thus means the education of people from the analog world to a disciplined use of language. On the hardware technology side, the focus is also on the 5G standard. The resulting networking of all participants thus represents an essential added value. In addition to illustrating an efficient solution for E-Pandemic Management, the concept can also be seen as a critique of current inefficient and non-digital attempts at pandemic management. The applied digitization step can create a central cloud-based platform that can be flexibly and easily extended by different modules and features depending on the use case. Nevertheless, it must be noted at this point that the system developed here is to some extent dependent on how willing the user is per se to release his data in the first place. Since the current Corona pandemic is a worldwide problem, there is an international and worldwide case for top-down coordination and bottom-up expansion or development of this concept. However, this will require appropriate centers to take up the coordination of such large-scale digitization projects in the future. In the future, there is also the possibility of expanding the concept and applying it to other phenomena - e.g. E-Climate protection or the E-Economy. Using an actual implementation of this concept, it will be achieved that the digital world is connected to the analog world via interactive application systems and the "educated citizen" and that a language-driven digitization and education of users to a disciplined use of language can take place.

Finally, it should be noted that for the successful implementation of such a concept a suitable infrastructure must be in place concerning cloud computing and the 5G mobile network - neither of which is yet the case in Germany. This also applies to digitization, applications and E-Education for the population. All of these areas still leave a lot of room for improvement compared with countries such as Israel. The motto now is: see how things are and do better than dictatorial states.

8 Glossary

E. The acronym "E" (e.g. in E-Pandemic Management) is derived from "electronic data processing" (EDP) and is used in the sense of "EDP-supported". A synonymous term

would also be "information technology-supported" or "IT-supported pandemic management."

Interactive Application System. Any information technology (IT)-associated object - to the extent that it is in the use of (language-enabled) humans or their actions - is an interactive application system, and its intercommunicating functioning depends critically on language mastery - on the part of both humans and technology.

Repository. A repository (plural: repositories) is a self-managing directory for storing and describing digital objects for a digital archive (e.g., database, program library). The described objects are usually not stored in the repositories.

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From Managing Diversity to Managing Opportunity

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Abstract. Companies with path-dependencies on trivial assumptions reach their limits in Society 5.0. Resilient and vital organizations need multiple reservoirs of competencies, i.e. their people's capabilities. Furthermore, resilient organizations in hypermodernity depend on an ability to respond to rising complexity by enhancing their own inner variety and competencies. Society 5.0 is characterized by a huge amount of diversity, and is human-focused. This paper presents a human-centered approach, the Capability Approach, which is conceptualized as a developed approach to Diversity Management. This paper goes beyond the classical diversity discourse, outlining an approach to Managing Opportunities in Society 5.0 that contributes toward the SDGs and Capability Management, introducing the Capability Cycle as a process for managing opportunities for dialogue-orientated communication. An economy designed for people requires a new diversity discourse – because the right to development is an inalienable human right.

Keywords: Diversity, Economy for People, Capabilities, Opportunities.

1 Human Diversity in a complex world

Considering the actual social, political, institutional and technical changes as well as tensions affecting Western economies, the salient issues facing Germany include a shortage of skilled workers, migration and demographic change. The digital transformation is affecting the labour market, entailing further issues around the future-focused reimagining and re-designing of work. Technological advancement and the New Economy shift have impacted social values, thus workplaces, preferences and roles are changing. The German Federal Ministry of Labour and Social Affairs [6] utilises the term „work 4.0“ to designate these developments.

The German economy is a special case in that its driving force is its powerful segment of small and medium-sized enterprises (SMEs) which represents the engine of the German economy. The resilience of the economy and its management in the interest optimal prospects depend on innovative development work by key actors and creative employees. Around 99 per cent of companies in Germany are SMEs [13], thus their great significance and powerful role in the economy is evident. A study conducted in [18] drew major attention to regional development by innovative promoters with regard to technology, tolerance and talent.

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According to Jacobs [21] and Glaeser [17], talent is what stimulates economic development and innovation. Vibrant human creativity and diversity can become a driving force for the economy and society. In practice however, rural and regiopolitan areas are suffering from brain drain. Demographic changes are revealing future challenges including labour shortages. According to an OECD [27] survey, nearly 90 percent of SMEs report shortages in the mid-level skilled labour while 65 percent are lacking highly skilled personnel. Both these figures are set to increase, exacerbating the challenges of retaining highly skilled staff and recruiting qualified individuals.

Generally, Western economies are experiencing rising contingency are subject to substantial uncertainty and are characterised by a dynamic complexity. A transformation amounting to the next industrial revolution is affecting companies, society and individuals as digitalisation inaugurates a new era of work in which much human labour will be replaced by algorithms. The aim behind efforts to develop resilient systems is to enhance choice and skills among the population [32]. Several studies have investigated inequalities in the labour market which accelerate brain drain in rural areas. Inequalities result from lacking economic, social and cultural participation by swathes of the population. Social discrimination plays a large role in relation to available skill levels in labour markets. Unequal employment opportunity and other labour market disadvantages translate into a capability gap for businesses.

The further chapters of the paper are: The Path of Diversity Management, that is followed by the chapter Managing Opportunity and finally ends with the conclusion.

2 The Path of Diversity Management

Discrimination is more than making distinction, representing a complex process of exclusion. The term is generally associated with unequal treatment or disadvantage. Understood as an influencing on how social norms and codes are defined, discrimination can be seen as a definitory power within a social system. Discrimination has tremendous negative impact on skill acquisition within society, reducing opportunity and participation in social and business life. Germany's political response around protecting employees against discrimination has included the General Equal Treatment Act (AGG), introduced in 2006. The ultimate cost of discrimination for society remains unmeasured. Public and private-sector organisations are responding to the problem of discrimination via Diversity Management as part of their CSR strategy, which is now a widely popular practice aimed at exposing and reducing disadvantage within organizations [28]. Diversity is defined by a set of six core characteristics addressed under §1 of the German Equal Treatment Act: ethnicity, gender, religion, physical disability, age and sexual orientation. Conventional diversity approaches are sharply focused on highlighting differences of human diversity so as to move away from one-dimensional attribution of identity and stereotyping in discourse in favour of a more nuanced, multidimensional view. Diversity is viewed as consisting conceptually of four areas [19]: personality (e.g. traits, skills), internal factors (e.g. gender, race, ethnicity), external factors (e.g. nationality) and organisational factors (e.g. position). Diversity awareness

is historically rooted in the social unrest of the 1950s in the United States [9]. As US corporations increasingly expanded overseas, the notion was imported into Germany via subsidiaries starting in the mid- 1990s. Over the years, three approaches have emerged as central concepts for diversity management [34]: fairness, access and legitimacy, learning and effectiveness.

The first and second of these approaches concern adapting organizations to changing environments while disregarding the management view and internal integration. The third approach concerns the internal management of diversity

Regarding the positioning of Diversity Management (DM) as an element of change processes within organizations, various approaches have been discussed in management and organizational theory literature, including Morgan [25]. Bolmann and Deal [8] reframe the organization with a focus on four distinctive frames: structural (focusing on goals, effectiveness and task), human resources (behavior and action), political (power, conflicts, influence) and symbolic or cultural (social interactions and symbols). In the political frame, the question of power and its distribution within organizations is of interest here, which is neglected in most DM literature. Purtschert [29], in another critical perspective on Diversity Management, states that instead of considering social justice, Diversity Management is much more focused on maximizing profit, thus being reduced mainly to economic efficiency variables.

3 Managing Opportunity

3.1 The Human-Centred Capability Approach

Society 5.0 is a concept aimed at the realization of a human-centered and creative society. It is important however to first have to examine the vision of a human-centred economy through the lens of the Capability Approach. The Capability Approach (CA) defined by Sen [33] and Nussbaum [26] is a multidimensional concept that addresses the economy of human well-being [31, 32]. It represents a critical response to the neo-classical approach, thus restoring ethical, moral and solidarity dimensions to the discussion of vital economic problems

Sen's interpretation [33] focuses on the 'doings' and 'beings' that people can achieve. These are referred to as 'functionings'. The capability set of one person is constituted by vectors of potential functionings which are available to choose from. Capability is bound up with opportunity and freedom, freedom requiring real opportunities [33]. The functionings achieved depend on the capabilities or opportunities that people have in order to reach the valued goal (capability set), which is in turn affected by conversion factors and available resources [33]. Conversion factors have a high impact on capabilities, as they allow people – if they desire- to turn capabilities into functionings. However, there are different types of conversion factors, as discussed in the literature. Deneulin and Stewart [14] outline the significance regarding the forming of capabilities of the structures of living together that define the properties of society, exploring how these are organized in terms of social norms, cultural practices and trust.

The most discussed conversion factors follow Robeyns' model [30], which recognises three groups of personal, social and environmental conversion factors. The individual or personal factors are internal to people, such as age, gender, ethnicity, talents and disabilities. Collective or social factors are aspects affected by the social environment of the individual (e.g. social and legal norms, discriminatory practices, power structures, societal hierarchies, an public policies respecting gender or ethnic discrimination). Environmental factors are external, including climate, geography, institutional resources and workfare policies. These factors are of major importance regarding the development of capabilities. All conversion factors have impact on beings and doings, and thus are relevant to freedom and the choice to convert resources into functionings.

The Approach emphasizes real freedom of choice and individual heterogeneity [22]. Well-being is viewed as relating to the freedom to live a life which the individual values [1]. The Capability Approach has been applied in various fields, though chiefly in regard to human development, inequality and poverty.

In respect of the intersectional theory [10] of multiple deprivation and disadvantage, human diversity in this work is kept consciously open. Intersectional theory concerns the multi-dimensionality and interrelatedness of plural forms of discrimination and identities. "Human diversity is no secondary complication (to be ignored, or to be introduced 'later on'); it is a fundamental aspect of our interest in equality" [33]. Human diversity is thus a primary consideration in the Capability Approach. Other normative theories recognize human diversity to a very limit extent.

Viewed through the lens of the Capability Approach, inequalities, power concentration, social discrimination and the reduction of diversity into singular affiliations generate deprivation of opportunities, freedom and development [31]. A capability gap results from lacking opportunity, meaning there is an imbalance between rights and opportunities and the ability to exercise and take advantage of these [20]. Ballet et al. [3] point out that differences in opportunity are associated with power inequality between different groups, explaining these problems as differences in power rather than culture. This reveals the great importance and impact of conversion factors in the social environment (context). The Capability Approach is a recognised concept in development economics with relevance to intersectional inequality.

3.2 The Process of Managing Opportunity

Sen and Nussbaum acknowledge empowerment in the context of human development, indirectly recognising two forms of empowerment within the Capability Approach: agency and expansion of the capability set. This paper looks at managing opportunity in the context of companies and business management, discussing how companies that tend to focus on cultivating staff potential represent promoters of agency in carrying empowerment and capability forward. Empowering people by enhancing their well-being and agency increases opportunity for greater achievement.

Developing human potential and capability is the task of managers and leaders, who are called upon to create supportive conditions and frameworks within the organisational context. Companies are subject to dynamic complexity, representing turbulent systems which can be seen as organically self-organising. In this context, monocultural

companies are past-oriented, too rigid and less able to learn from experience and adapt accordingly, due to lacking creativity and innovation.

Ashby’s law, also known as Law of Requisite Variety, states that: “The larger the variety of actions available to a control system, the larger the variety of perturbations it is able to compensate” – which creates challenges for management [24]. According to Lewin [23], organizations can only be changed if their people change. And organisational change is a process, even as all change represents a learning process.

This explorative literature paper is theoretical and interdisciplinary. The research goal is to flesh out the classical Diversity Management approach in relation to the Capability Approach. It thus links the Capability Approach with the systemic-relational approach of organizational development, tying in with new perspectives on managing diversity in organisations. The study defines diversity as multiple competencies which represent problem-solving skills [4]. Managing diversity in organisations is therefore a matter of managing capabilities [28].

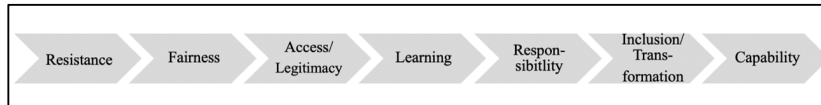


Fig. 1. Paradigms of Diversity Management [28]

With regards to the research lack of identifying capabilities in business cases, this paper presents a methodology for developing capabilities in organisations consisting of three primary steps: Diagnosis, Implementation and Reflection.

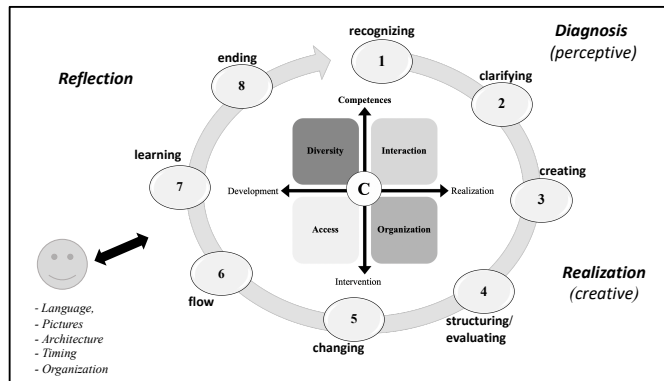


Fig. 2. The Capability Cycle [28]

This method, called the Capability Cycle, is a systemic-relational process of enabling capabilities, change and learning [28]. As is it a context-sensitive approach, it helps create a development-friendly context. The method recognises four levels within business organizations for defining capabilities (C): diversity (field of competencies, development area), social interaction (realisation options), organizational structure and

access to resources (intervention options), These four main areas have to be taken into account in the three primary steps of the cycle (Özdemir, 2019) in an iterative communicative interaction process consisting of eight stages: (1) recognizing, (2) clarifying, (3) creating, (4) structuring/evaluating, (5) changing, (6) flow, (7) learning and (8) ending (Bergmann 2014).

Every interaction begins with special occasions or a welcoming speech. The first steps involve defining a common ground, starting with the recognising of team members and relevant participants and followed by arriving at a mutually accepted description of the problem, then by arrangements regarding the issues. Members of the same team will have different backgrounds and have enjoyed differing opportunities. The manager has to place great emphasis on soliciting different views proceeding from the diverse socio-demographic characteristics of his/her team members. This helps generate a great deal of commitment in support of the project.

Arriving at a shared perspective around the task at hand becomes possible by jointly clarifying the context and working out commonly acknowledge rules. The second step is diagnosis, i.e. constitution of a common ground for agreement on mutual goals, competencies, visions and problems. Visions and guidelines facilitate identification, orientation and development. Erpenbeck and Heyse define competence as the capacity or ability to self-organise [15]. Competencies can be described as problem-solving skills.

Step three is about creating opportunity, solutions and differences. Creativity can often be promoted via 'abduction', such as in and through free zones that force team members to dissociate from the problem. Other well-known creativity methods include usability, brainstorming, mind mapping, brainwriting, method 635 and morphological boxes. After developing forward-looking ideas, team members then evaluate and plan possible solutions together to eventually arrive at joint decisions.

To realize a change in step five, one can intervene in the context, actors or institution. This in turn is possible by changing 1. language/images (e.g. concerned and respectful interaction, positive expressions by changing words), 2. design/architecture (e.g. pleasant working atmosphere), 3. organizational structures (e.g. flat hierarchies) and 4. time management (e.g., idle time, flexible working hours) [24]. Project members are invited to report and evaluate results and voice praise or criticism in the next stage. In the best-case scenario, participation and common decisions allow experiencing a flow which then in stage seven yields patterns for reflecting and learning. The project concludes with all participants providing feedback on their experiences.

Team organization is founded on the motivation of the members by decentralized and participatory nature promoting success. The main tasks of the manager or facilitator are to provide new ideas and provoke thought create a framework of interactively developed standards and goals and fostering a fearless atmosphere that gently supports vitality and overall development. This creates a favourable environment for cultivation of a shared culture and a conducive atmosphere for dialogue, communication, engagement and lasting relationships [7]. According to Ferrucci [16], only the kindest will survive. People in flow are friendlier, happier, more cooperative and more generous [11.]

This management approach makes possible the integration of heterogeneity into organizations. The manager plays a highly important role in shaping the change process

as the leader in forging and maintaining relationships with other actors, and in relation to the environment, products and other considerations. Managing means creating and forming the context by intervening in (a) language, images, culture, (b) time, (c) organisation and rules, (d) rooms and spaces and (e) people [4].

4 Conclusion

Conventional diversity discourse is sharply focused on highlighting elements of human diversity around a one-dimensional attribution of identity and stereotyping, at pains to point out that differences matter and how discrimination and exclusion take place on various levels. Beyond conventional discourse however, as in this paper, diversity management is looked at in terms of managing capability. The task of identifying capabilities for business cases is thus contextualized.

Enhancing capabilities requires a development-friendly management framework such as that introduced by the Capability Cycle – a relationship and context management process. While changing people as such is not possible, the framework and working conditions in which they function, i.e. the institutional and organisational context, can be influenced. Changing the framework or context effects behavioural changes that influence people and their relationships. This paper argues that differences between human beings should not form a basis for discriminatory practices, and that developing employee potential and promoting capabilities and opportunities should be the primary goals in view of the unchangeable traits of human beings (e.g. gender, ethnicity). For this is necessary to alter power dynamics in companies and social environments.

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Representing SME Creditworthiness in Society 5.0

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Abstract. Society 5.0 envision a human-centered society that balances economic advancement and the resolution of social problems by a system that highly integrates cyberspace and physical space. This exploratory paper focuses on SME limited access to credit. Access to financing is a significant social issue for society in eradicating poverty and achieving economic equality. Despite their significant contribution, credit constraints hinder SME's growth and development. We present our argument that conventional financial institution representation on SME creditworthiness may not be sufficient to mitigate the information asymmetry issue in serving the SME lending market. This exploratory paper investigates the challenges in representing SME creditworthiness and proposed a solution to mitigate the issue. Society 5.0 agenda presents an opportunity to reengineer creditworthiness representation because of newly available technology in collecting, analyzing and sharing data. Since the process requires an intelligent agent to interact with the accumulated knowledge for reasoning and decision-making purposes, a knowledge representation of SME creditworthiness is necessary to achieve the agenda.

Keywords: SME, Creditworthiness, Knowledge Representation.

1 Introduction

Access to financing is one of the significant social issues that become a constraint to society. Leaders are designing agendas and strategies to reduce economic and financial disparities with the financial inclusion initiative [1]. Financial inclusion is a significant building block for poverty reduction and economic growth. The ultimate goal is to improve the overall quality of the societies lives by allowing them to use financial services [2]. One of the significant debates on financial inclusion is SME access to financing. The financial inclusion market presents an enormous opportunity potentially from banking underbanked SMEs [3].

SMEs will open economic opportunities worth USD12 trillion and create 380 million jobs by 2030, with more than 50 per cent of the opportunity located in developing countries [4]. The SME spectrum plays a prominent role in social-economic development. The sector contributes to national income, employment, productivity, support large enterprises and encourage entrepreneurship [5]. Despite their significant importance, access to financing remains a primary constraint for SME development in

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developed and emerging economies. The sector requires access to financing for their creation, survival and growth [6].

Society 5.0 envision an ideal form of the future ‘super-smart society’ through a high degree of merging between cyberspace and physical space and leveraging ICT. The concept necessitates a balance of economic advancement and the resolution of social problems. The usage of IR4.0 technology will perform a role as an agent that supports the smart-society, thereby optimizing the entire social and organizational system [7]. Society 5.0 will feature an iterative cycle in which data are gathered from the real-world, analyzed in cyberspace, and converted into meaningful information to derive real-world solutions for managing or improving society. The cycle emphasis on knowledge accumulation and sharing on a societal level to allow continuous improvement [8].

Society 5.0 present an opportunity to achieve balanced economic development and resolve the social issue, mainly around poverty and economic inequality. Therefore, SME limited access to financing is a significant issue that needs to be solved. We present our argument that conventional financial institution representation on SME creditworthiness may not be sufficient to mitigate the information asymmetry issue in serving the SME lending market. This exploratory paper explores the issue of representing SME creditworthiness and proposed a solution according to Society 5.0 recommendation.

This paper is organized into six different sections. In section 2, the paper explores the fundamental problem of lending and factors contributing to the information asymmetry in serving SME borrower. Section 3 discusses the methodology applied to conceptualize the solution to solve the issue according to Society 5.0 vision. Section 4 provides a recommendation on formulating a knowledge representation of SME creditworthiness to mitigate the information asymmetry issue. Section 5 discuss the general characteristics expected of the knowledge representation of SME creditworthiness. Finally, the last section summarizes the exploratory paper and discusses future research and limitation.

2 Literature Background

In this section, the discussion begins by exploring literature about SME borrower characteristic, the concept of creditworthiness and the impact of information asymmetry in lending. The literature provides an overview of the lending phenomena in serving underserved borrower.

2.1 SME Access to Financing

SME faces structural challenges due to information asymmetries, and the sector is deemed to be lacking in financial skills and knowledge [6]. Lending business to SME risky even if default probabilities are heterogeneous across maturities, regions and risk levels. SMEs poor-credit assessment, lack of collateral, incomplete documentation and lack of credit history have made the banks reluctant to lend. Fluctuation in income or

earnings volatility causes high uncertainty on returns and has severe implication on SME credit quality [9].

High uncertainty and vague credit status have prompted the bank to credit ration the sector to reduce the potential risk of credit losses. Credit rationing has become a bottleneck that restricts SME growth and development [10]. The opaqueness of the firms makes it very difficult for SME to obtain formal credit. The banks require transparent information regarding the financial health of the firm. The majority of the SMEs do not maintain decent financial statements of their transactions and operate in an opaque manner. Therefore, the banks and financial institutions hesitate to provide credit to SMEs because of information asymmetry that leads to adverse selection and moral hazard issues [11].

The foundation of the decision-making processes on lending depends on economic data. SME limited data contribute to the information asymmetry problem [12], results in higher risk and discourages bank lending [13]. Opacity and uncertainty of SMEs characteristic have led to unfavorable creditworthiness value. Conventional banking requirement for formal credit could not fit the underserved SME borrower. The literature supports our argument that the bank representation on SME creditworthiness is not sufficient to mitigate information asymmetry in this risky segment.

2.2 Information Asymmetry Impact on Creditworthiness

The money lending business will always be affected by credit risk. There will be an element of uncertainty in credit transaction that poses a form of risk to the lenders [14]. Credit risk is a financial risk when the creditor faces losses because the borrower does not repay their debt obligations [15]. Therefore, an important aspect of the lending business is credit evaluation to determine repayment probabilities. Borrower's creditworthiness provides the basis for the lending decision and the pricing and structuring of the loan agreement [16].

The ultimate purpose of credit analysis is to assess the borrower creditworthiness. [17] provide an interpretation of creditworthiness as the "*economic and legal capacity of the borrower to obtain a loan and return it to the commercial bank following the terms and conditions of the agreement*". [18] indicate creditworthiness must take into account the borrower's ability to receive, efficiently using, and repaying credit. The concept of creditworthiness is significant in lending and remain the underlying factor that represents a worthy borrower. Empirical evidence suggests creditworthiness has a significant positive influence on access to finance [19].

Before receiving credit, a borrower needs a reputable credit rating. Conventional lenders want the most creditworthy borrowers to protect themselves from default risk. Information asymmetry is a form of information disconnect that affect the credit evaluation process. Information asymmetry is a concept about two transacting parties, with one party always knowing more information than the other [20]. In a perfect market theory, complete and costless information is available to both parties and no uncertainties regarding present and future trading conditions. The parties do not suffer from market failure due to the completeness of the information. However, in the real world, information is neither perfect nor costless. Thus, information asymmetry is an acute issue

in small businesses financing because of high risk and uncertainty regarding future conditions [21].

Efficient markets require a mechanism to overcoming the imperfect information problem. Financial intermediaries exist to overcome market failure and resolve the information asymmetry problem. Distortion of information in credit allocation will lead to adverse selection and moral hazard problems. Adverse selection increases the probability of a loan being disbursed to borrowers with bad credit risks. Moral hazard lowers the probability of loan repayment [22]. Information asymmetry distorts borrower's creditworthiness information and the issue is more significant when it comes to SME borrower because of their characteristics.

Improving the scale and efficiency of SMEs finance requires financial innovation to improve enterprise credit systems, and promote better capital management for SMEs [23]. Therefore, the literature supports our argument that information asymmetry reduces lending market efficiency and is causing all credit rationing behaviour on SME borrower.

3 Methodology

How to represent SME creditworthiness in Society 5.0? is a fitting research question to explore the new conceptualization. This exploratory paper will utilize the integrative review to address the new emerging topics. The method provides an overview of the knowledge base, critically review and potentially reconceptualize, and expand on the theoretical foundation of the specific topic. The methodology is suitable to create initial or preliminary conceptualizations on a new topic. The review requires a more creative collection of data. The purpose is usually not to cover all articles ever published on the topic but rather to combine perspectives and insights from different fields of research traditions [45].

Although an integrative review can be conducted in many ways, researchers are still expected to follow accepted conventions for reporting on how the study was conducted [46]. Therefore, the paper explores literature to understand the concept of Society 5.0 visions to achieve economic advancement and the resolution of social problems. This paper conceptualizes the solution through knowledge representation to achieve AI and provide initial characteristics of the knowledge representation.

4 Knowledge Representation of SME Creditworthiness

Financial institution and banks require an optimal functioning credit mechanism based on the timely repayment of borrowed resources. Therefore, distributing a loan to a worthy borrower based on the credit rating approach was applied. The rating provides a general idea about the borrower and the quality of the loan portfolio. The rating approach is valuable because it requires a constant collection of updated information [17]. The purpose of credit scoring is to provide a concise and objective measure of a borrower's creditworthiness. The credit scoring system provides a firm basis for the lending decision and enhances time efficiencies making decisions [24].

Formulation of credit score or credit rating utilizes a various type of determinants. Information or data is fed into an assessment model, and the result represents the borrower creditworthiness. Lack of public information, inadequate quality and frequency of financial statements compared to large enterprises makes it difficult to assess and monitor SMEs credit risk [25]. [26] indicate managing credit risk for SMEs requires models and procedures specifically designed for SME. The conventional creditworthiness assessment model may not fit the sector.

Credit score or credit rating is the underlying borrower creditworthiness information. A finite number of determinants is applied and processed to generate a credit score. The term determinant is defined as a factor that collectively and decisively influences the probability of default or risk level of a borrower. Society 5.0 agenda on the advanced fusion of cyberspace and physical space presents an opportunity to reengineer creditworthiness representation because of new technology available in collecting, analyzing and sharing data. The process requires an intelligent agent to interact with the accumulated knowledge for reasoning and decision-making purposes. Therefore, a knowledge representation is required to represent SME creditworthiness.

Knowledge representation is a symbol used to represent propositions, built on knowledge or information. Modern computer applications use knowledge representations in various contexts, including information search, simulation, web semantic ontology description [27]. Knowledge has become the main value driver for modern organizations and a critical competitive asset. A successful knowledge representation provides a means for expressing knowledge and facilitates the inference processes in human and machines [28].

[29] elaborate knowledge representation is about understanding and describing the richness of the world, which carries five distinct roles. The function of knowledge representation act as a surrogate inside a reasoner for the things that exist in the world. It is also a set of ontological commitment that represents an approximation to reality, highlighting a specific part of the world. The focusing effect is essential because the complexity of the natural world is overwhelming. The third role for representation is as a fragmentary theory of intelligent reasoning that typically motivated by some insight indicating how people reason intelligently. Based on the pure mechanistic view, representation is a medium for efficient computation and inevitably central to the notion of representation. Finally, it is also a medium of human expression to express the world.

The goal of the representation system is common sense reasoning. There are four underlying properties to ensure a desirable representation system. The system must show representational adequacy to represent the required knowledge and inferential adequacy to manipulate the knowledge. The third properties are inferential efficiency, which refers to the ability to direct inference methods into productive directions and respond with limited resources. Finally, acquisitional efficiency refers to the ability to acquire new knowledge, ideally or automatically [30].

Designing an Artificial Intelligence (AI) problem-solving application requires strategies to solve specific problems as it will depend on one type of knowledge representation. AI requires a large amount of knowledge and a mechanism to manipulate the knowledge or information to create a solution. Specific knowledge representation models allow for more powerful inference mechanisms to guide the search for a solution

[31]. AI ability to solve a problem depends on the ability to represent knowledge about the world. AI reason with the knowledge or information to obtain meaningful answers. The development of knowledge representation must be rich and close to the predicament to express the knowledge needed to solve the problem through computational gain [32].

Knowledge representation can take the form of a knowledge model. Knowledge Modelling can simulate intelligence as envisioned in Society 5.0 to enhance innovation, progress and prosperity, and all depends heavily on making the “right decisions”. Knowledge Modelling is a critical element of cognitive discipline and a prerequisite for reaching true AI. It incorporates the quantitative and qualitative use of information and processes tangible and intangible attributes that contribute to a decision. Other benefit includes the ability to constantly monitor, improve and assist humans to learn from past decisions, assess present activities and preserve domain expertise [33].

Therefore, achieving the Society 5.0 vision in solving one of the prominent social issues through AI requires a knowledge representation of SME creditworthiness. The representation can be conceptualized into a knowledge model that enables IR 4.0 technologies to continuously improve social wellbeing and achieve balance economic development. The knowledge representation of SME creditworthiness will consist of specific domain knowledge and information that forms the knowledge model.

5 Characteristic of SME Creditworthiness Knowledge Model

The development of the SME Creditworthiness Knowledge Model must consider specific characteristic that applies to the creditworthiness domain. The model is built on knowledge and modelled for an intelligent agent to perform reasoning and decision-making. The discussion on the characteristic of the knowledge model is to ensure the applied knowledge for decision-making is valid, mature, and high quality [34]. A low-quality knowledge base will prompt the intelligent agent to make loosely based decision-making. Each knowledge is a combination of various determinant classified together into two main characteristics, including a discussion on the role of knowledge representation.

5.1 Hard-Information

The hard-information, mainly financial or standard banking ratios is a conventional but significant determinant applied in assessing borrower creditworthiness. Hard-information is information recorded as numbers such as financial statements, payment history, or quantity of output. It is in quantitative form and can easily be collected, stored, and transmitted electronically. The context during information collection is not significant, and data collection does not need to be personal [35]. Banking and other financial institutions rely heavily on hard-information to assess borrower’s creditworthiness.

There are three main dimensions of hard-information. The nature of hard-information is quantitative or a number. The collection method is impersonal or does not depend upon the context of its production, therefore hard-information exhaustive and

explicit. Finally, hard-information is not susceptible to cognitive factors such as subjective judgement, opinions and perception. Collecting hard-information is low cost and easily automated with technology. It has a comparability and verifiability element, allowing a separate process of collecting and using the information [36].

Hard-information exhibits greater inference of high grade or worthy borrowers. The creditworthiness representation is based on verified financial information applies by banks to screen borrowers [37]. Therefore, hard-information is essential in comparing creditworthiness across borrowers and categories of borrowers. It is a fundamental element in risk management mechanisms that can mitigate information asymmetry [38]. There are three different class of hard-information consist of profitability conditions, solvency and liquidity conditions and quality of credit relation. The three-class indicate business capabilities in generating profit, meeting long term and short-term financial commitment and obligation, and credit behavior.

In this section, the characteristic discussion provides an overview of hard-information. Financial information has become the basis of the credit risk assessment model across the different financial market. Hard-information has been proven theoretically and in the general practice of their reliability to gauge borrower creditworthiness. Therefore, hard-information will be the fundamental knowledge in the creditworthiness knowledge model.

5.2 Soft-Information

The role of soft-information in financial markets has grown significantly in characterizing the lending environment and influencing the design of the lending market [35]. Since SMEs are weak in financial infrastructure and lack transparency, extending credit to the sector has become an obstacle. With limited hard-information, assessing borrower creditworthiness requires the lending market to rely more heavily on soft-information [39]. Small business loans rely more on relationship lending due to a lack of hard-information [40].

There is a variety of costless information that help improve market transparency, efficiency and provide a better signal on borrower's creditworthiness. Soft-information provides valuable input in credit appraisal, and together with hard-information will improve the loan performance. The use of soft-information became a possible alternative and a complementary solution to address information asymmetry. Soft-information signals the reliability of the business owner, however, it is subjective to cognitive interpretation [41].

The soft-information capability to increase hard-information predictive power is documented in empirical research that aims at investigating the qualitative factor impact on default risk prediction. The information is in qualitative form and non-verifiable, therefore manipulable, but produces a more precise estimation of the borrower quality, despite the subjective judgment, opinions and perception [36]. The determinant can be classified into demographic characteristics and social capital, and each of the determinants influences future loan performance. The demographic characteristics consist of determinants like age, race, gender and origin. Social capital or social connectivity can be friends, groups and a picture of the borrower [42].

The interconnected nature of society in cyberspace through various social platforms has open new possibilities in expanding soft-information determinant. Information diffusion through the online network can be collected and applied in improving lending outcomes for both high and low-risk borrowers [43]. It is considered a digital footprint, and the determinant possesses a discriminatory ability to determine borrower creditworthiness. The digital footprint can be considered as a proxy for income, character and reputation and is highly valuable for default prediction [44].

In this section, the soft-information characteristic provides an overview and potential of the newly available information to enhance the credit assessment process in determining SME creditworthiness. The addition of soft-information must complement hard-information to feed the credit assessment model because of SME limited information. Therefore, this class of determinants must be applied in the knowledge model.

5.3 Role of Knowledge Representation

The final characteristic discusses the role of knowledge representation. Each role provides a characteristic view of the knowledge model in representing specific knowledge. The knowledge model must represent all the knowledge of creditworthiness pertaining to SME borrower in lending. The roles are based on [29] description and presented below.

Table 1. Role of Knowledge Representation

Role	Description	Creditworthiness Representation
Role 1	A Knowledge Representation Is a Surrogate	Functions as a surrogate inside a reasoner. The knowledge representation enables an intelligent entity to determine SME borrower creditworthiness.
Role 2	A Knowledge Representation Is a Set of Ontological Commitments	The knowledge representation is an approximation to reality, meaning the knowledge is relevant to be applied in determining SME creditworthiness.
Role 3	A Knowledge Representation Is a Fragmentary Theory of Intelligent Reasoning	Intelligent reasoning indicates how people reason intelligently. The knowledge representation will enable an intelligent entity to distinguish between worthy and unworthy SME borrower to receive their loan request.
Role 4	A Knowledge Representation Is a Medium for Efficient Computation	Reasoning in a machine is a computational process. The knowledge representation will enable the computational process of the determinants that represent SME borrower regardless of the applied assessment methodology.

Role 5	A Knowledge Representation Is a Medium of Human Expression	Medium of expressing worthy and unworthy borrower to receive funding.
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6 Conclusion

Society 5.0 agenda on the advanced fusion of cyberspace and physical space presents an opportunity to reengineer creditworthiness representation because of new technology available in collecting, analyzing and sharing knowledge. IR4.0 innovative technologies are pushing society towards the post-computing age into a new digital era. The field of AI enables computer systems to behave intelligently and goes beyond numerical computations and manipulations. AI programs focus on problems that require reasoning to solve the problem. The success in solving problems depends naturally on the ability to represent the knowledge about the world that enables the AI to reason with the knowledge to obtain meaningful answers.

AI-based on big data should be applied to its full potential in achieving AI-autonomous credit risk assessment on SME borrower. Technological innovation can optimize the credit risk mechanism to a new level, improve lending efficiency and promote financial inclusion. Conventional risk mechanism in banking may not be sufficient to represent the risky segment of the borrower market. Our proposed solution on knowledge representation of SME creditworthiness can become the basis for building an AI system and mitigate information asymmetry issue in lending.

6.1 Future Research and Limitation

Society 5.0 vision offers an exciting future in enhancing socio-economic development with the help of IR4.0 innovative technology. Developing a complete knowledge representation of creditworthiness requires extensive research. The knowledge model development must consider reusability across different economies and different risk level. Classical or modern theory on the quantitative aspect of creditworthiness knowledge domain has been thoroughly developed by scholars and applied in conventional lending. Future research opens a new opportunity to investigate suitable qualitative aspect and alternative data to supplement hard-financial information for credit assessment. The development of the creditworthiness knowledge model must consider a future empirical study to test the knowledge model in a real-world application.

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The Determinants and Interest on Mobile Commerce Adoption among East Coast Entrepreneurs in Malaysia

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Abstract. Mobile commerce among rural entrepreneurs is still in the infancy stage. This study investigates the determinants and interest of mobile commerce usage among east coast entrepreneurs in Malaysia regarding purchase and sale activities. A questionnaire was adopted and adapted from the Unified Theory of Acceptance and Use of Technology (UTAUT) and previous empirical studies. 400 questionnaires were distributed through online and face-to-face survey methods for the east coast entrepreneurs in Malaysia. The purposive and snowball sampling method was applied in this study. 360 samples were subsequently analysed using descriptive statistics and multiple linear regression analysis aided by SPSS 26.0. The study found that social influence was the most significant factor in mobile commerce utilisation among east coast entrepreneurs in Malaysia. About 71.1% of east coast entrepreneurs in Malaysia were interested in mobile commerce in expanding their business network at least once a month. It highlighted that the mobile commerce adoption has good attention from east coast entrepreneurs in Malaysia. The finding obtained that the east coast entrepreneurs in Malaysia were ready for implementing mobile commerce in their business activities. Hence, it added significantly to bridging the knowledge gap concerning the infancy rate of mobile commerce usage among rural entrepreneurs. This empirical study provides significant input to all stakeholders, including government, relevant stakeholders (e.g. entrepreneurs, supply chain industry, telecommunications industry, and ICT industry), and local communities to strategise further initiative mainly for society, economic and country development.

Keywords: Mobile Commerce Adoption, Determinants, Interest, Unified Theory of Acceptance and Use of Technology (UTAUT), East Coast Entrepreneurs

1 Introduction

1.1 Overview of Mobile Commerce

Malaysia Digital Economy Corporation in 2020 stated that the high rates of mobile phone users display a good start for Malaysian to be involved with mobile commerce,

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which may contribute significantly in leading Malaysia's digital economy forward. Mobile electronic commerce is one of the many subsets of electronic commerce. Mobile commerce is a pairing of mobile devices that directly uses a mobile terminal and a wireless access network with a commercial transaction and other convention activities [1]. In other words, mobile commerce can be translated as the use of cellular phones to perform commercial transactions online, comprising the purchase and sale of products.

Mobile commerce usage needs to flourish to meet the customer's demand, as the demands of the consumers for quicker access to information about product and services increasing day by day. [2] reported that the function of mobile devices is not limited to communication purposes, but it is valuable for information gathering, various commercial activities, and business and financial transaction, hence contributing to the possibility of mobile commerce utilization that grows progressively [3]. Mobile commerce corporations are one of the fastest-growing sectors at present. It has turned into an essential trade operation, which accounts for 62 percent, 37 percent, and 1 percent of users who made an online purchase via mobile phones, laptop or desktop, and other means respectively [4]. These proportions demonstrate that mobile devices are preferable than others in purchase and transaction activities. It may help consumers manage business activities, get better profitability through effective communication, reduce business-related travels, time-saving, and speed internal processes [5].

However, [6] and [7] indicated that mobile usage in business activity, especially among rural entrepreneurs in Malaysia, is still in the infancy stage due to the greater challenges they face than urban entrepreneurs. These challenges must be overcome by identifying the key determinants that encourage them to accept technology transformed. In addition, today's situation needs them to take a drastic shift from the traditional approach to full mobile commerce utilisation. This transformation is vital to facilitate them with current business trends. Otherwise, it is hard for them to survive and sustain their business. Besides, embracing the digital economy and utilising mobile commerce as part of their vital tools in running their business will ensure the sustainability of their business.

The government encourages the entrepreneurs on the mobile commerce usability in expanding the business network. For instance, the Ministry of Rural Development (MRD) has increased the entrepreneur's online presence through the e-entrepreneur programme and organised *Ekspo Inovasi Teknologi dan Keusahawanan Desa (INOTEKDESA)* Programme. In this situation, mobile commerce is one of the best platforms that need to be adopted as most Malaysian owns a smartphone. The increased wireless handheld device like a smartphone is one of the keys that drive mobile commerce adoption to perform commercial transactions online, like purchasing and selling products. In addition, [8] also agreed that the rise in smartphones' popularity unlocks a new opportunity, needing to understand the features that identify the acceptance of mobile commerce by every person, including entrepreneurs. The effort by the government demonstrated that they are always ready to give full support to each level of entrepreneur's whether urban or rural entrepreneurs.

However, the level of mobile commerce usability among rural entrepreneurs and the key determinant that encourage entrepreneurs to use mobile commerce needs to be

identified for the government to take the further effective initiative in helping entrepreneurs expand their businesses. Therefore, the study on analysing the key determinant that influences the use of mobile commerce and the interest level of mobile commerce adoption among east coast Malaysia's entrepreneurs must be identified. The East Coast Malaysia is selected as a study site as most rural entrepreneurs originate from these regions.

The finding of this study contributes to the new discovery in terms of the interest level of rural entrepreneurs in Malaysia towards mobile commerce adoption. It also provides the updated information as studied by [6] and [7]. At the same time, this study able to identify the key determinant of mobile commerce adoption. This output will benefit the local authorities in improving the existing plan and policy to ensure the rural entrepreneurs move forward by following the current trends incorporating the convenience and existing technology.

2 Literature Review

2.1 The Concept and the Use of Mobile Commerce in Purchase and Sale Activities

The most significant impacts of mobile commerce on business and entrepreneurship have attracted comprehensive responsiveness from various levels, including academicians, researchers, general practitioners, and policymakers [9]. Mobile-commerce is the current business technology that is changing the way organizations conduct their business, including the business to business (B2B) and business to customer (B2C) and changes stakeholder relationships [10]. The uniqueness of the mobile commerce feature has provided entrepreneurs with unprecedented flexibility and convenience in online business. Due to mobile use's popularisation supported by internet facilities, it has become a vital part of rural residents to utilize it for daily activities [11]. For entrepreneurs, it helps their business activity because the technology utilization provides residents in a rural area with a novel solution undertaking entrepreneurship transformation change [12]. They found that 18.41% increase of technology utilization will increase the entrepreneurs' online purchases and sales by 11.15% and 14.69%, respectively.

2.2 Application of Unified Technological Acceptance and Use Theory (UTAUT) in Mobile Commerce Adoption

The Unified Technological Acceptance and Use Theory (UTAUT) is the most frequent theory used to explain technology adoption, including adopting mobile commerce [8, 10, 13, 14]. It was improved by the presence of attitude and computer self-efficacy. It was used as the theoretical basis for this study since it has been widely tested and empirically validated across several fields of technology implementation [15]. Based on the previous studies, there were four main components of the UTAUT model: effort expectancy, performance expectancy, social influence, and facilitating conditions. [16] reported that the performance expectancy can be well-defined as the person trusts that using the system will enhance users' jobs. The degree to which technology adoption

will benefit the users in performing certain activities is known as effort expectancy. Whereas, the belief that existing organisational and technical infrastructures to support system implementation is named as facilitating condition. Social Influence defined as the views of a person as to whether peers and individuals of value to the person feel that he or she should participate in the action [17].

Performance expectancy will affect consumer satisfaction to continue the use of products. It was reflected as one of the core determinants of the intention towards technology adoption [18]. [3] believed that the customers would start to engage with technologies once they find them valuable. [19] acknowledged that effort expectancy is a dominant determinant in expecting the individual intention to use mobile banking. The customers will use e-banking when they recognise it has a positive impact on their jobs. [15] proved that the actual use of MOOCs for the student in higher learning education was influenced by the performance expectancy and social influence. In this case, computer self-efficacy is treated as an external factor and has a significant effect on performance expectancy.

Friends, colleagues, and family were part of social effects toward using mobile commerce [17]. It denotes the belief about whether most people favour or dislike the behaviour of users in adopting new technology. [20] analysed the effect of social links to fulfil and continue mobile social applications, hence verified the crucial impacts of social influence on technology adoption. However, [8] highlighted that performance expectancy and social influence did not significantly influence the low-income group's intention to use mobile commerce. Additionally, [21] mentioned a significantly negative relationship between performance expectancy and individual intention due to the moderating effect of perceived risk.

[10] determined that effort expectancy, computer anxiety, and commitment anticipation influenced users in adopting new technology applications, including mobile commerce. The user adoption of the mobile commerce system has a substantial effect over a longer period. The study's findings by [22] declared the effort expectancy as a predictor of consumer intentions to use ATMs with Fingerprint Authentication in Ugandan Banks. It was also supported by [23] in analysing the use of smartphones for mobile learning. Surprisingly, [24] found that effort expectancy was not significant determinants of the intention to use e-government services among China citizens.

[25] reported that facilitating conditions with high-quality infrastructures significantly influence the use of mobile apps as a platform for shopping. [8] also showed that there is a significant positive relationship between facilitating conditions and the intention to use mobile commerce and declared as the best predictor for mobile commerce adoption compared to other factors including effort expectations, performance expectancy, social influence, and perceived security. However, a previous study by [26] in Saudi Arabia remarked that the facilitating condition was not significant in forecasting students' behavioural intention of mobile learning technology acceptance.

Based on the extensive literature, the previous studies produced diverging results in significant core constructs of UTAUT due to the differences in national culture and economic development that could moderate the impact of constructs of any technology adoption [8]. It is strongly believed that the output for this study might differ from the

previous studies. Hence, the UTAUT model was adapted in mobile commerce utilisation for purchasing and sales activities to analyse the key determinant and level of interest of mobile commerce adoption among east coast entrepreneurs in Malaysia. The research hypotheses of this study are as follows:

1. Hypothesis 1 (H1): Performance expectancy is a determinant for mobile commerce adoption for sale and purchase activity among east coast entrepreneurs in Malaysia.
2. Hypothesis 2 (H2): Effort expectancy is a determinant for mobile commerce adoption for sale and purchase activity among east coast entrepreneurs in Malaysia.
3. Hypothesis 3 (H3): Social influence is a determinant for mobile commerce adoption for sale and purchase activity among east coast entrepreneurs in Malaysia.
4. Hypothesis 4 (H4): Facilitating conditions are determinants for mobile commerce adoption for sale and purchase activity among east coast entrepreneurs in Malaysia.
5. Hypothesis 5 (H5): Rural entrepreneurs in east coast Malaysia are interested in using mobile commerce for sale and purchase activity.

3 Methodology

3.1 Research Design

This study employed a quantitative approach. The primary data based on the survey questionnaires were used to gather information about the determinant and the level of interest of mobile commerce adoption. A pre-test was conducted to check the validity and reliability of the questionnaire. This study established the six sections of the questionnaire based on the previous empirical literature and the UTAUT theoretical framework. The first section provides the demographic profile of each respondent. The effort expectancy, performance expectancy, social influence, and facilitating condition information were underlined in the second, third, fourth, and fifth sections. The last section encloses questions on the level of interest towards mobile commerce adoption. It was measured by using the frequency of use in a month. Specifically, the measurement ranges from 'never use', 'minimum usage', 'moderate usage', 'high usage' and 'maximum usage'. This study used a five-point Likert scale which was measured from 'strongly disagree' to 'strongly agree' for each section except the first section.

3.2 Validity and Reliability Tests

The validity and reliability test of the questionnaires used the Content validity index and Cronbach alpha coefficient. The questionnaires were distributed to thirty respondents to check for validity and reliability. The questionnaire items were analysed using SPSS software and found that the validity and reliability to be valid with content validity above 0.7 and reliable with Cronbach alpha coefficient greater than 0.6. Hence, no updated questionnaire design is required.

3.3 Population, Sample Size and Sampling Technique

Rural entrepreneurs in East Coast Malaysia were the population for this study. The questionnaires were distributed to the rural entrepreneurs in East Coast Malaysia through face to face and an online survey. This study employed purposive and snowball sampling techniques for both surveys. The questionnaires were only given to the entrepreneurs who use mobile for business activities. The list of these groups were captured based on the suggestion by the previous respondents. The online survey was done through google form. While, the face to face survey was done at the owner premises and it took about 20 to 30 minutes per respondent to complete the questionnaire. A total of 400 questionnaires were distributed and only 360 questionnaires were returned.

3.4 Statistical Technique

The descriptive statistic and multiple linear regression analysis aided by SPSS version 26.0 were applied to examine the level of interest and determinant of mobile commerce adoption respectively. The independent variables comprise effort expectancy, performance expectancy, social influence and facilitating condition. Meanwhile, the frequency of mobile commerce usage is known as the dependent variable. Based on [22], descriptive statistics and linear regression are essential because they provide a simple and easy-to-understand presentation of the results. In addition, this method is suitable since this study is just a preliminary study.

4 Results and Discussions

4.1 Respondent's Profile

Table 1 summarized the respondents' profile. The majority of respondents were females (66.9%) and young entrepreneurs (64.1%), below 40 years old. Half of them were married (56.9%); hence they probably have their own families. In terms of education level, 42.5% of the respondents notably have at least a diploma certificate. A majority (88.1%) of the respondents had a monthly income of RM1,200 – RM5,000. Another notable point is that even though more than half of the respondents possess a maximum SPM certificate, only 7.2 per cent of them earned an income below RM1 200. These statistics showed that they were aware and willing to adopt the current technology trend, enhancing their household income even though they were not highly educated. Lastly, Table 1 indicated that most respondents have never attended any training during their business activity (73.9%). It was strongly believed that the number of rural entrepreneurs utilizing mobile commerce can be increased if they attend any training regarding the integration of technology, innovation and entrepreneurship. In addition, the number of mobile users keep increasing year by year and become an essential device for daily life activities [11].

Table 1. Demographic Profile of the Respondents

N=360	Frequency	Percentage (%)
Gender		
Male	119	33.1
Female	241	66.9
Age		
Below 30 years old	111	30.8
31 to 40 years old	120	33.3
41 to 50 years old	80	22.2
51 to 60 years old	44	12.2
61 years and above	5	1.4
Marital Status		
Married	205	56.9
Single	125	34.7
Divorced	30	8.3
Education Level		
Primary School	31	8.6
PMR/SRP	33	9.2
SPM	143	39.7
Diploma/STPM	114	31.7
Degree & Above	39	10.8
Monthly Income		
Below RM1,200	26	7.2
RM1,201 – RM3,000	163	45.3
RM3,001 – RM5,000	154	42.8
RM5,001 and above	17	4.7
Training		
Never	266	73.9
1 to 2 times	82	22.8
3 times and above	12	3.3

4.2 Determinant of Mobile Commerce

Next, this paper seeks to identify the determinant of mobile commerce adoption among rural entrepreneurs in East Coast Malaysia. By using multiple linear regression analysis, this study found that all four (performance expectation, effort expectation, social influence and facilitating condition) components of UTAUT have significantly influenced mobile commerce adoption. As presented in Table 2, the attributes of performance expectation ($\beta = 0.222$, $p < 0.01$), effort expectation ($\beta = 0.318$, $p < 0.01$), facilitating conditions ($\beta = 0.192$, $p < 0.01$), and social influence ($\beta = 0.241$, $p < 0.01$) were positively and significantly affecting the entrepreneurs' mobile commerce utilization at 1 percent significant level. The findings were supported by [8, 15, 22]. An R-squared

of 86.1% reveals that 86.1% of the data fit the regression model. This study demonstrated that performance expectation, effort expectation, social influence and facilitating condition were the main determinants for mobile commerce adoption among rural entrepreneurs in East Coast Malaysia. Thus, this study supported hypothesis 1,2,3 and 4.

The results determine that social influence was the most influential factor affecting mobile commerce usage among rural entrepreneurs. The finding reveals that peoples' experience influenced mobile commerce adoption among entrepreneurs in using it. Family, friends and IT experts are the potential groups that inspire rural entrepreneurs to use mobile commerce. In addition, [22] believed that word of mouth by reference groups play a crucial role in influencing rural entrepreneurs to use mobile commerce. Effort expectation was the second most substantial factor that encouraged rural entrepreneurs to use mobile commerce. The finding reveals that entrepreneurs can easily learn mobile commerce since most (64.2%) are young entrepreneurs (age below 40). The youth are more aware of innovations as they may have experience of various technologies and have good fundamental knowledge in applying them [2]. Performance expectation was also a factor of mobile commerce utilization. This result shows that rural entrepreneurs in East Coast Malaysia's mobile-commerce are optimistic and expect their success. The rural entrepreneurs believe using mobile commerce is useful and helpful because it may improve identity assurance and security of their money while carrying out business transactions. These results were supported by [10] and [22]. Instead of having a direct relationship between effort and performance expectation and mobile commerce usage, [27] believed that personal innovativeness would mediate the relationship between effort expectancy and performance expectancy and behavioural intentions to adopt mobile commerce.

The least influential factor was facilitating condition. This study referred to facilitating condition as the existing facilities including hardware and software materials, skill and knowledge and human resources. Compared with other factors, these facilities do not strongly help entrepreneurs engage with mobile commerce application. The reason is the mobile commerce is still new types of e-commerce which is the users were not familiar well with their interface and facilities offered. Thus, it seems necessary to provide essential technology resources, information and continuous support to encourage rural entrepreneurs to use mobile commerce [22].

Table 2. Determinants of Mobile Commerce Adoption (MCA)

Hypothesis Path	Std. Beta	t-value	R ²
H1: Performance expectancy → MCA	0.222	8.482***	0.861
H2: Effort expectancy → MCA	0.318	9.694***	
H3: Facilitating condition → MCA	0.192	6.647***	
H4: Social Influence → MCA	0.241	9.884***	

Note: ***p<0.01, **p<0.05, *p<0.1

4.3 Level of Interest on Mobile Commerce

This study posed a simple question to the respondents to gauge their interest in whether they were interested in using mobile commerce to expand their business network. By using the descriptive statistical analysis, the results were very encouraging as shown in Table 3, where 71.1 per cent of rural entrepreneurs indicated that they had used mobile commerce at least once a month. Most of them were from a group below than 41 years old. The youngster group interested to integrate technology into entrepreneurship activity. They accepted the technology changes and were willing to move forward in ensuring that they are not left behind in business activities. They were also interested in integrating the technology components in their business activity by fully utilising the existing technology for income generation. The finding also revealed that the rural entrepreneurs responded positively and were ready for mobile commerce adoption. It showed a good start for the entrepreneurs because Insider Intelligence forecasts that mobile commerce will inch closer to become consumers' preferred channel for online shopping within the next five years. Hence, it was believed that mobile commerce continues to evolve more popular. Thus, this study supported hypothesis 5.

Table 3. Mobile Commerce Adoption by Rural Entrepreneurs

Mobile commerce Utilization per month	Frequency	Percentage(%)
Never Use (0)	104	28.9
Minimum (1-2)	32	8.9
Moderate (3-5)	75	20.8
High (6-10)	117	32.5
Maximum (11 and above)	32	8.9

5 Conclusion and Recommendation

This study concluded that performance expectancy, effort expectancy, social influence and facilitating condition were determinants of mobile commerce adoption for sale and purchase activity among rural entrepreneurs in East Coast Malaysia. This study also concluded that 71.1% of rural entrepreneurs in East Coast Malaysia were interested in using mobile commerce in expanding their business network. It highlighted that they were ready to implement mobile commerce in their business. Hence, supports the government agenda and believes this kind of technology transformation adoption is significant for their business growth. This valuable finding is vital for the government to strategize further initiatives to boost rural entrepreneurs' business growth.

6 Limitations and Future Study

This study found that 28.9 percent of rural entrepreneurs were not involved with mobile commerce, and it was believed that the percentage might be more than that due to the number of samples collected were just 400. The finding will be more informative if

future research could involve more sample size and extend the current study on identifying the barriers that the rural entrepreneurs face in engaging with mobile commerce in their business. Other than that, subsequent research should implement the structural equation modelling method since the current approach has certain limitations.

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Effects of Home Office on Employees' Working Conditions during Covid 19 Crisis in Switzerland

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Abstract. The current pandemic poses special challenges for employees. A survey was conducted in April and May 2020. The impact of the switch to home office on the living circumstances, quality of life and Well-Being was investigated. 333 respondents (female 62%, male 38%) participated in this survey. The results show there during these weeks a high level of Well-Being in the home office. More than 70% of respondents feel comfortable in home office and would like to maintain this type of work organization after the corona crisis. Leadership is a decisive factor. Working conditions at home (suitable working environment, undisturbed work) are less decisive for Well-Being than good leadership by the superior. Findings show the necessity of clear communication rules, so that employees are optimally integrated into the work processes and content. In addition, a high degree of personal autonomy in the home office and, at the same time, close integration into the team is important for the Well-Being of employees. Employees would like to keep the autonomy they gained even after the crisis. However, there are increasing demands due to digital leadership. Under these conditions, leadership means providing orientation and support from a physical distance, as well as promoting the autonomy of the employee. As a negative impact of home office, it can be stated that employees miss regular social exchange with colleagues. In consequence, the presence at the workplace should be used as quality time for building sustainable and resilient working relationships.

Keywords: Abstract. **Keywords:** Home office • Working conditions • Well-Being

1 Initial Situation

The world is for more than one and a half years now in the pandemic crisis. With the change from office work to home office, the working and living conditions changed fundamentally [18]. The authors conducted a survey in March and April 2020 in order to determine to what extent the change to a home office has influenced the living conditions, quality of life and Well-Being of employees [3, 5, 8].

The present study also aims to investigate whether leadership principles that have already proven effective in everyday business life are also effective in the home office

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and whether there is a connection (correlation) between digital leadership, Well-Being and resilience in the home office.

2 Home Office in Switzerland

Teleworking and home office is not a new phenomenon. According to the Swiss Federal Statistical Office, in 2018 about 138,000 people were working more than 50% of their working time in so-called teleworking from home. Another 445,000 were regularly in their home office, but with less than 50% of their workload. An additional 478,000 employees did this occasionally [1]. It can be assumed that of the 5.1 million jobs in Switzerland [2], the vast majority of employees have switched to home office work during the pandemic crisis. In 2016, 87% of employees wanted to have more of a home office, with the proportion of temporary home offices at that time standing at 28% [4]. By 2014, about half of the 4.9 million employees in Switzerland would already have been able to work from home or on the move, both in organisational and technological terms [11].

In principle, the home office offers many advantages, but also disadvantages. First of all, it saves time for users because commuting is no longer necessary. Working hours can also be made more flexible. The prerequisite is that the home office has the technical and Organisational-spatial prerequisites to carry out productive work. The disadvantages may be that the manager has to make additional efforts to accompany employees in their home office. In addition, personal social contacts are limited because the home office organisation means that colleagues are seen less often. Personal contacts cannot be fully compensated for by voice and video calls.

3 Digital Leadership

During the crisis, leadership made an important shift from leading employees in presence to do called digital leadership. There are various characteristics of digital leadership, it requires leadership at a distance without direct personal contact between leaders and guided persons, the use of suitable software tools and the application and implementation of basic leadership principles. Furthermore, good digital leadership is characterised by the fact that, despite "social distancing", an empathic relationship between the superior person and the employee is maintained even via virtual communication.

The basic principles of effective and efficient management include, above all

- clarifying the roles of team members in the delivery of services.
- clarification of tasks and duties of the home office staff.
- clarifying the integration into the operational processes.
- allowing freedom to bring in own ideas.
- the application and effectiveness of the principles of digital leadership
- establishing clear rules of communication in dealing with other group members.

4 COVID-19 - Challenges for Employees and Management

The pandemic poses special challenges for employees and their families. Home office under the conditions of the pandemic also means that freedom of movement is fundamentally restricted. Employees are faced with additional tasks, such as organizing their daily lives while at the same time reducing social contacts. Or looking after children and instructing them in distance learning. Many of the employees also worry about relatives and friends who are not well cared for, who need help or who may even be ill. Quite a few employees are worried about whether and how long they will keep their jobs, whether Short-time work will be introduced and whether they can stick to their career plans under the very uncertain conditions. For many employees, the pandemic poses many different challenges and burdens. But each of these burdens has its own quality. It is obvious to speak of the pandemic as an event that brings with it very different burdens and can certainly trigger a crisis. This crisis is a crisis for society and the economy, but it is also a crisis or critical life event for individual employees. What makes such an event a crisis? Fore sure there was hardly any preparation time, a pandemic is only foreseeable to a limited extent, we can only draw on a few experiences, the interrelationships are complex and difficult to manage, the negative effects are difficult to control, and living at loss has a lasting negative impact on Well-Being. Such emotional problems can put a strain on social relationships and also promote illness. The special thing about the pandemic is that it affects everyone. It is also special that we can understand the restrictions as a service to the community. This helps to deal with the negative consequences [6].

5 Resilience and Competence

In this context, we are working on the assumption that in the course of one's professional life, challenges will always arise that will have to be overcome. Under certain circumstances, this may lead to a reorientation, to a development of professional skills in everyday work as well as to an adjustment of one's own goals, wishes and interests. If coping with these challenges is successful, one speaks of "career adaptability" or "career resilience". Here, resilience is defined as successful professional action under difficult Job-related conditions. As with the general concept of resilience, personal and environmental risks and strengths are considered decisive for positive coping.

Work in the home office under conditions of the pandemic is now subject to a variety of stresses and strains that can, but need not, be associated with the pandemic. Other burdens can be added and all of them together can have a lasting negative impact on people's thinking, feeling and acting. People who are burdened but cope well with these burdens are considered resilient. Resilience is often understood as "the positive adaptation and sustainable development of a system to respond to Short- or Long-term everyday challenges or severe stress. Based on internal system processes and through dealing with the environment, the system defines new reference values and develops required competencies, and the ability to cope with future stresses improves" [13, p.557]. It is therefore not just a matter of overcoming a challenge or coping with pressures. It is also about the acquisition of skills and competencies, about changing attitudes so that future challenges can be better mastered. Whether or not such a

development takes place depends to a large extent on the strengths and support available within the person and in the environment. And it is certainly decisive whether and to what extent it is possible to positively influence the strengths within the person or the support in the environment. It is therefore a matter of direct control of what is happening as well as influencing all factors that can influence the perception and shaping of what is happening. An important contribution to Well-Being is that I can influence the essential factors of what is happening and thus have control over the current and future development. Resilience and Self-Efficacy (resilience and Self-Efficacy in Figure 1) are therefore closely related [14].

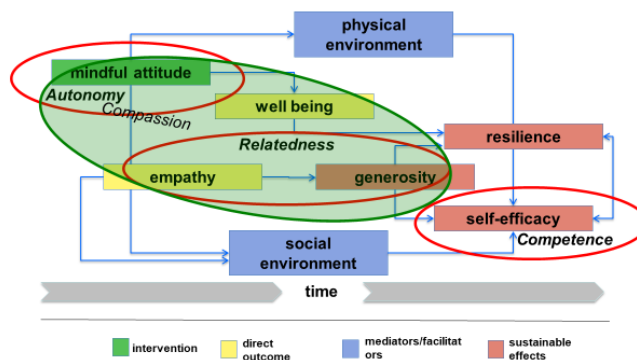


Figure 1: Factor model mindfulness, resilience, and social support over the life span [17].

Within the framework of our joint work in the research network "Mindfulness, resilience, and peer support across the life span" we have designed a model of conditions in which mindfulness and Well-Being, empathy and generosity are important factors on the individual side. With them Self-Efficacy and resilience can be promoted. This model is based on the basic assumption that people only consistently direct their actions towards Well-Being, health and their own positive development if the actions themselves serve their basic needs. The basic needs include autonomy, integration in social relationships and the experience of competence. Compassion and generosity, i.e. the willingness to stand up for others, to participate, are not only educational or socialisation goals but also important basic conditions of human life.

6 Research Questions and Design

Certain aspects of the COVID-19 crisis can now be understood as a particular constellation in the physical and social environment of the employees. It should be remembered that home office in general and home office under the conditions of the COVID-19 crisis are not the same. Under the influence of the COVID-19 crisis, personal freedoms are severely restricted. This also poses special challenges for management. Under

difficult conditions, it has a positive influence on motivation and performance and has to make its contribution to ensure productivity. The home office is no longer a right, but rather a civic duty, combined with the duty to perform the required work in the home office as well. In addition, large parts of the population not only have health concerns, but also considerable uncertainty about the safety of their own workplace. This outlines a field of hypotheses and variables that the questionnaire must take into account.

One of the basic conditions of human life is that environmental conditions influence individual behaviour and experience and individual development [15]. The social dimensions of employment, but also the social dimensions of family and friends, of the living environment and the community have an influence on the course of development. In addition, we assume that aspects of the physical environment are important protective factors or even pose risks. An attractive residential environment with plenty of space, green spaces and opportunities for leisure activities is generally regarded as a protection factor, while noise pollution and various disturbances are considered risk factors, e.g., also for work in the home office. It is therefore obvious that in this survey we have considered aspects of behaviour and experience, work organisation and management, as well as life design and the home environment. In detail, we asked for eight biographical data and data on professional biography. They were asked about the extent and duration of work in the home office, the occupational field and type of employment, as well as attitudes towards work in the home office.

Well-Being and resilience were surveyed using standardised questionnaires. Standardised questions on teamwork and team leadership complemented the various aspects of home office work. The physical environment became an issue by asking about living space, rooms and number of people, but also about the quality of the residential area and the wider living environment. The survey was completed on 21 May 2020. The survey involved 333 respondents* (female 62%, male 38%). Most of them have been working as employees in the service sector (economy, education, social affairs, administration) for more than 15 years. The respondents were invited by spreading requests through various distribution lists and target groups. This means that the link to the questionnaire was sent via the authors' networks and then forwarded to third parties by other helpers.

7 Objectives of the Survey

The survey served to assess the Well-Being and the experience of stress in the home office in times of the COVID-19 crisis. From the data obtained, recommendations can be deduced for work in the home office, for the design of interaction under the conditions of virtually mediated communication and leadership. These recommendations are helpful in the current situation as an impulse for consultation as well as for the design of management. They will also be helpful in the future, when more work is done from the home office and thus hybrid forms of work are to be promoted.

Key questions of the project therefore concerned:

- Individual Well-Being and individual resilience under home office conditions due to pandemic.
- The satisfaction with this special form of work.

- The satisfaction with the work in the team and with the leadership.
- The social and physical protection factors in the environment in their importance for the evaluation of work, and one's own Well-Being and resilience.
- The application and effectiveness of principles of digital leadership.

8 Structure of the Questionnaire

At the beginning, the respondents were informed about the purpose of the survey and about anonymity, confidentiality and the central concerns and structure of the survey: "With these questions we would like to know how working conditions and work experience under the influence of home office in quarantine are. We would like to assure you that all your information is confidential, and that the evaluation will be anonymous. With your information you will help us to better understand this new situation and to be able to give better advice. Thank you very much for your support! The questionnaire has two parts. The first part deals with everything that characterizes the current work situation. The second part focuses on your personal attitudes."

The questionnaires covered different aspects: Questions about age, gender, accommodation were followed by questions related to the type and duration of work, current employment and current occupational field. This was followed by the Well-Known WHO questionnaire on Well-Being [19]. Resilience was surveyed via a questionnaire developed by Schumacher and colleagues [9]. The questionnaire by Singh and Kolekar served to measure commitment [12]. Leadership style was measured by the scale developed by Janssen and van Yperen [7]. In addition, the employees were asked to evaluate their living environment using items from the former DFG Knowledge Transfer Project on Social Change and Neighbourhood by Claus-Christian Wiegandt, University of Bonn.

9 Results part I: Demographic Part. Questions about the Living, Professional and Working Situation

To describe the sample, it should be noted that the average age of the respondents is 42.17 years (N=317). The proportion of women in this sample is 59.2% (N=320). The average age of women and men is comparable. The vast majority of the respondents live in a household with two to four persons (N=238 of 320). Just over 25% live in a household with at least one child under the age of 17. Slightly more than 10% have a family member over 60 years old. 75% have an apartment with more than 80 square meters (239 of 318). About 10% report that they are living in quarantine. This means that they are infected themselves or have been in direct contact with an infected person (N= 33 of 310). Regarding the occupational situation, we have information on the employment relationship and the occupational field.

There are no significant differences in the duration of employment in the individual occupational areas. Most have been employed for 10 or 13 years.

We can also assume that the majority of respondents work with virtual tools, feel well oriented in the group and in their tasks, and can actively participate in the work. And that they tend not to feel lost or suffer from distractions from third parties.

With a similar scaling, the respondents seem to feel rather well. Their resilience is quite pronounced. Attitudes toward the team are also described as constructive. The employees pay attention to the contribution they themselves can make to good teamwork. Even if one's own contribution to the success of teamwork is seen, the influence and importance of leadership is definitely perceived more concisely. The respondents are thoroughly satisfied or relatively satisfied with their neighbourhood. Opportunities for active and "healthy" leisure activities are probably of particular importance.

10 Results Part II: Personal Attitudes toward Home Office, Well-Being, and Resilience

As the data show, Well-Being and resilience are closely related to satisfaction with the neighbourhood and the opportunities for active leisure activities. In the following, the two key variables Well-Being and resilience will serve as reference variables for aspects of leadership or "absolute" and relative time in the home office. There are strong links between resilience and Well-Being on the one hand and team leadership scores on the other. The actual time spent in the home office, on the other hand, has no influence on Well-Being and resilience. As the data show, however, there is a very close correlation between general satisfaction with the work situation ("I am satisfied with the new home office job") and the Well-Being or resilience of the employees. The autonomy of the work in the home office quite obviously also makes a decisive contribution to this ("I see opportunities to work autonomously").

11 Statements with great Significance for Well-Being and Resilience

In the following section, this gives us the opportunity, as an interim conclusion, to name those statements that are of great importance for successfully coping with work and life under the conditions of the pandemic.

In our findings, a large number of variables are moderately or strongly related to each other. How can these variables be meaningfully ordered? We elaborated a factor analysis. The majority of the items load quite high on one main factor. This main factor stands for "performance," for successful work in the home office and under the special conditions of the pandemic. Satisfaction with the work situation, general Well-Being and resilience go hand in hand with the perception of autonomy, role security, task clarity and good communication in the team [16, 17].

As a result of the factor analysis relating working conditions to resilience and Well-Being (three components were extracted via principal component analysis), one main factor emerges that lists conditions for a successful home office: (1) I am happy with the new home office work (.597). (2) I see opportunities for me to work autonomously (.537). (3) My role in my group (team) is clear to me (.509). (4) I know my

tasks and duties (.548). (5) I know how I am involved in the operational processes (.609). (6) I have the freedom to contribute and implement my ideas (.567). (7) There are clear communication rules when dealing with my group members (.592). (8) I would like to keep this form of work (home office) even after the COVID-19 crisis (.616). (9) I miss the interpersonal contacts I had in my old work environment (.462). (10) I wish to return to the previous organization of my work in my ancestral workplace (.463)

12 Evaluation and Interpretation

In this era of the COVID-19 pandemic, one's Well-Being in the home office is dependent on individual, social and other environmental factors.

High level of Well-Being in the home office: More than 70% of respondents feel comfortable or very comfortable in the home office and would like to maintain this type of work organization after the COVID-19 crisis.

Leadership as a decisive factor: The working conditions at home (suitable working environment, undisturbed work) are less decisive for Well-Being than good leadership by the superior. Clear communication rules: Rules for communication and processes must be defined so that employees are optimally involved in the work processes and content.

Desire for autonomy: Great personal autonomy in the home office and simultaneous close integration into the team are particularly important for Well-Being when working at home. The employees would like to retain the autonomy they have gained even after the crisis. If it becomes clear that productivity can also be ensured in the home office, then any restriction of this newly gained freedom could lead to a loss of motivation.

Increasing demands due to digital leadership: Under these conditions, leadership means providing orientation and support from a physical distance and promoting the autonomy of the employee. This sets new standards and demands on management. It is becoming more demanding because employees have become more independent [10].

Home office as a normal form of work: It can be assumed that pressure will increase to allow home office as an equal or even normal form of work even after the COVID-19 crisis.

Lack of social exchange: At the same time, respondents miss regular social exchange with colleagues.

Quality Time: Presence at the workplace should be used as quality time. On-Site work meetings will remain important in the future for building sustainable and resilient working relationships. Physical meetings will become quality time for creative meetings and innovation workshops.

13 Outlook

The present results are quite encouraging. They show that many feel up to the challenge of converting their work to home office and that personal attitudes, social

relationships and good guidance from management are important protective factors for remaining fit for work even under the more difficult conditions of the pandemic. Furthermore, they also show where consulting needs can arise, and which offers could promote positive coping with the upcoming challenges. Politicians should be encouraged to foster home office working conditions. Employers should acknowledge the fact that home office infrastructures would enhance employees to strengthen their motivation, productivity and well-being.

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Apprenticeship-Based Entrepreneurship Education: Review of Malaysia Approach

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Abstract. Apprenticeships are regaining popularity in Malaysia. The purpose of this paper is to provide an overview of apprenticeship-based education in Malaysia, to examine current government policies, and to investigate current issues concerning further apprenticeship development. Apprenticeships have traditionally been thought of as a path to a stable job. Although they have a bad reputation at times, apprenticeship programs frequently disregard various laws and the rights of apprentices. Higher-level skills are becoming more in demand as the knowledge economy grows. This is analogous to the idea that starting a business is difficult and necessitates a lot of experience in today's competitive environment. It has an impact on the popularity of apprenticeships as well as "academic" paths such as higher education. For a graduate to receive an apprenticeship degree, several success factors must be considered. Many publications keep tabs on the nature and value of apprenticeships. This paper examines how good new practices can be applied to entrepreneurial pedagogy options, as well as the evolution of apprenticeships.

Keywords: Apprenticeships, Entrepreneurship Education, Higher Education.

1 Introduction

Entrepreneurship has emerged as a promising catalyst for diversifying economic growth and sustaining competitiveness in the face of globalization [1]. By creating new job opportunities, entrepreneurship can help developing countries revitalize stagnant economies and address poverty issues [2]. Indeed, in a country where entrepreneurship education should be prioritized, this strategy relieves the government of the burden of addressing unemployment [3]. In this context, the university, as a knowledge center, should fully embrace its role as a critical platform for encouraging entrepreneurship. As a result, many nations are empowering entrepreneurship education, fostering an entrepreneurial environment that promotes the mindset, skills, and behavior of entrepreneurs [4], [5]. As a result, the entrepreneurial entity acts as an entrepreneur, managing their careers and providing employment to society [6].

Entrepreneurship education is widely regarded as the impetus for launching a new business. It may, however, aid in the development of knowledge and skills that will be useful in future life journeys. To date, graduate starting ventures have been the primary focus of increasing interest among scholars, primarily in developed countries [7].

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Because of the skills, knowledge, and mindset taught in entrepreneurship education, particularly in corporate entrepreneurship, prominent entrepreneurship graduates are thought to have a higher proclivity to start a business [8]. As a result, entrepreneurship education is one of the most effective methods of reducing unemployment because it produces more job creators than job seekers [9].

Entrepreneurship and unemployment are inextricably linked issues, and the field of entrepreneurship is one solution to this imbalance. According to Malaysia's Department of Statistics, only 2,347 graduates started their own businesses in 2015 and 2,833 in 2016[10]. Accordingly, over 200,000 graduates graduated and left higher education institutions in 2019. This means, over 200,000 job seekers try to find work in Malaysia each year, potentially increasing the country's unemployment rate. This is consistent with data from the Department of Labor, which shows that the unemployment rate remained at 4.7 percent in August 2020. "By 2020, the Higher Education Ministry expects that 15% of students will venture into entrepreneurship while still pursuing studies at institutions of higher education, with 5% of them having the primary goal of becoming entrepreneurs upon graduation," according to The Star.

Today, the increase in this statistic is even more significant because the world is dealing with health issues, resulting in a pandemic, which causes a slowdown in the economic sector and, as a result, an increase in unemployment. The Malaysian Statistics Department reports that the unemployment rate for 2020 has been set at 5.5 percent as a result of the movement control order (MCO) imposed to prevent the spread of Covid-19. This is the highest unemployment rate since the 1990s, when it was 5.7 percent. Previously, the Statistics Department reported that the unemployment rate in the second quarter was 4.7 percent, with a slight decrease in the number of people aged 15 to 64 to 741,600. From July of the previous year, there was a 0.5 percent decrease.

The government and universities are critical in addressing the unemployment issue and combating the rising unemployment rate. Several initiatives have been launched by the government to reduce graduate unemployment. As a result, in early 2013, the Malaysian government began designing and developing the Malaysian Education Blueprint (MEB) 2015-2025 through the Ministry of Higher Education. Under the new education policies, the government fosters an entrepreneurial culture, particularly among graduates and universities, and leads the ecosystem. Graduates are increasingly creating jobs rather than looking for them [12].

In July 2020, the government reintroduced the National Apprenticeship Scheme (SPN), which is more focused on apprenticeship programs to increase the rate of graduate employability among those affected by covid-19 pandemics. This multi-ministry collaboration is a youth and sports ministry initiative to increase youth employability and provide training and employment opportunities. According to a report from the Malaysian Ministry of Youth and Sports, as of November 2020, 397 apprentices had participated in the program, with 376 interns benefiting from job placement. It means, 94.7 percent were successful and went on to work for the companies that participated in this program. The program's goals include: (1) increasing apprentices' marketability through "soft skills" and on-the-job training; (2) providing a support system for youth to help them get jobs; (3) assisting in the reduction of youth unemployment; and (4) signing up 5,000 people using the Human Resources Development Fund's (HRDF)

"place and train" concept. The SPN programme, on the other hand, is more concerned with reducing the immediate unemployment rate, regardless of employment field. According to the Ministry of Human Resources, over 67 companies registered with HRDF and InvestKL have participated in this SPN program to train and employ the young and unemployed. The goal of this paper is to examine the landscape and meaning of entrepreneurial apprenticeship, as well as to investigate the potential critical issues and challenges encountered in developing an agenda or policy relating to a graduate entrepreneurial apprenticeship [13].

2 Apprenticeship Based Learning for Entrepreneurship in Malaysia

Throughout history, the term "apprenticeship" has been defined in various ways [14]. Today, it most commonly refers to education or training that provides students with marketable skills to start their own business or careers. Apprenticeship exists in a liminal space between training and work environment. An apprentice will be exposed to a challenging working environment, and even the stereotypical mandatory task of making photocopies is commonly regarded as a rite of passage [15]. The lack of a well-defined position frequently contributes to unscrupulous employers exploiting employees through apprenticeships by promising valuable training.

As a concept, internships refer to the process of learning in natural work environments through authentic work activities and interactions. The programs typically involve a group or business arrangement to gain experience, skills, or contacts for future employment opportunities [16]. Apprenticeships, on the other hand, are high-intensity and high-frequency forms of work-based learning in which the learner spends the majority of their time in the industries where they acquire the majority of their skills. The majority of apprenticeships and traineeships last two to four years [17]. An entrepreneurial apprenticeship, on the other hand, allows an apprentice to gain valuable entrepreneurial skills, a network, and an understanding of running a growing business in exchange for hard work and a low wage.

The Ministry of Education announced the Malaysia Education Blueprint 2015-2025 (Higher Education) in 2013, with the goal of increasing previous graduate employability by more than 80% by 2025. One strategy for improving graduate entrepreneurs, graduate employability, and skill mismatch is to implement an industry-led curriculum. In this regard, universities and industry must collaborate to co-create appropriate curriculum. To help graduates improve their entrepreneurial skills, the Ministry of Education launched an entrepreneurial apprenticeship program. This new learning strategy encourages businesses to collaborate with universities to create curricula that provide students with a more comprehensive entrepreneurial experience. The Entrepreneurship Apprenticeship Program will be supported by mentors from academia and industry [12] with expertise both on and off campus.

Participants in the Entrepreneurship Apprenticeship Program can study on campus for two years before beginning a year of apprenticeship training. During the final year of their studies, the candidate will eventually manage his or her own business. Through

an entrepreneurial venture that emphasized work-based learning models, the curriculum was developed to increase the employability of local graduates. Graduates typically participate in a specific work placement for an extended period of one or two years in the industry, typically between the third and final year of their undergraduate program. Universities must carefully consider their relevant pro-grammes to the industry and entrepreneurial environment in response to industry feedback that university graduates are unqualified and lack specific capabilities [12].

The concept of entrepreneurial apprenticeship-based learning is not new, and it has already been adopted by many other developing countries. In Malaysia, however, industry professionals will collaborate to develop academic curricula that are much more relevant to the needs of entrepreneurial development. Additionally, graduates' exposure to industry locations to experience this curriculum allows them to gain confidence and virtual business experience. A graduate who has prior experience and actively participates in a practical and constructive learning program will improve their graduate profile, self-confidence, productivity, emotional intelligence, and leadership skills. The most important aspect of an entrepreneurial apprenticeship program is that graduates develop relevant, practical entrepreneurial skills through content-based, university-industry collaborative pedagogy [12].

3 Key Considerations for Improvement

Because the young are the ones who will drive the country forward, and their role in ensuring the country's global competitiveness will be critical in the future [18]. Without a doubt, they are among the most important contributors to economic and social development. As a result, a country must be prepared to improve the development of their business skills in order for them to become proficient in conducting business in a natural business environment while also contributing to the growth of the country's economy through the creation of various job opportunities. This means that, in order to develop the entrepreneurial sector, the government's policy to improve the quality of entrepreneurial apprenticeships must be considered [19]. Some justifications serve as primary benchmarks in the development of an entrepreneurial apprentice system that allows graduates to start new businesses. However, some issues impede the creation of excellent and efficient entrepreneurial apprenticeships.

3.1 Cost of Living

When choosing an apprenticeship placement, students always consider the cost of completing an apprenticeship. It can result in more serious problems, such as gaining access to potential employers and apprenticeship placement opportunities [20]. Graduates who will be undergoing training will be required, as is customary, to relocate and live off-campus in major cities such as Klang Valley, Johor Bahru, and Penang, where their living costs will rise and be a significant factor in choosing an apprenticeship. The monthly cost of living in a big city like Kuala Lumpur, according to Belanjawanku, will be more than RM 1,870. A person uses public transportation to get to work. Obtaining financial support from parents may be one of the financial resources available when the

apprentice undertakes the placement to assist the apprentice in completing an apprenticeship. Inequality in access to excellent learning support will result from a lack of financial aid, which will limit apprentice-ship opportunities [21]. The apprentice's costs may also influence their decision to take a low-quality or irrelevant apprenticeship placement. Another thing to remember is that those entrepreneurial apprentices are usually required to pay their fees for the duration of the apprenticeship, even if they are not attending classes that semester [22].

3.2 Apprenticeship Rights

Unpaid apprenticeship programs and paid apprenticeship programs are legally distinct. This results in a double injustice for the apprentice, who interprets the apprenticeship as falling between the gaps of employment law and graduate protection law. An apprentice who does not receive any salary payment violates the concept of employment and is denied the employee's rights and benefits under employment law, including the payment of the minimum wage. Apprentices who do not obtain employee rights may be denied other employee rights, such as protection from sexual harassment and workplace discrimination [23]. This example shows how the need to consider equating workers' rights with apprenticeship rights can be linked to achieving an inclusive learning environment.

3.3 Industry Desire

Under the apprenticeship scheme, industry workers assigned to mentor the apprentice must devote time and energy to supervising the apprentice [24]. Industries, on the other hand, have limited resources such as skilled workers, space, and equipment. Although the majority of these industries only hire one or two apprentices, it can benefit the industries, as well as small and medium-sized businesses. Even if it is unpaid labor, it may be difficult to shoulder the responsibilities of industries to train apprentices. In Malaysia, small and medium-sized businesses account for 98.5 percent of all businesses (SMEs). Malaysian SMEs devote the least amount of their annual budget to training and development, according to the Khazanah Research Institute (KRI) Report. As a result of granting the apprentice the right to an essential employee, the burden on the company's ability to continue operating will be increased. As a result, one of the company's stakeholders withdraws from the apprenticeship program [25]. This happens because the company's profitability is the primary goal in its future planning, and it will be evaluated on an annual basis. As a result, industries invest in less profitable and less volatile projects. The goal of entrepreneurial apprenticeships for both the apprentice and the university is to produce experienced, skilled, and successful entrepreneurs who will build their businesses after graduation. This goal harms industries' perceptions of the apprenticeship programme because the apprentices they train will become competitors in their business. As a result, policy considerations must be made to balance industry, university, and apprentice motivation.

3.4 Enrichment of Academic Opportunities

As part of the graduation requirements, most programs require a 3-to-6-month internship at the company. As a result, more students in higher education institutions are looking for internship opportunities. Approximately 250,000 students will find internship opportunities each year. Unfortunately, universities have no control over their students' availability to work in the industry [26]. Competition for an apprenticeship can be both positive and negative because students pursuing an entrepreneurial apprenticeship must undergo comprehensive learning by mastering natural entrepreneurial environments in order to prepare apprentices to build their businesses in the future [25]. As a result, it is difficult for the industry to train a large number of entrepreneurial apprenticeships at the same time in order to provide comprehensive training. Hundreds of thousands of students from other majors have applied for internships at their companies as well. As a result, the placement of students is skewed. These apprentices may perform irrelevant apprenticeships and fail to meet the apprenticeship objectives if they are not properly guided [27]. Because of the placement competition, the apprentice will be treated poorly while completing the apprenticeship. Higher education institutions should collaborate and form close relationships with industry in the future to ensure a steady supply of high-quality entrepreneurial apprenticeships.

3.5 Rules and Regulations

The accessibility and effectiveness of new laws and regulations to protect the rights of apprentices should be emphasized [28]. When implementing the law on an apprenticeship, various cost implications must be borne by the apprentice, industry, or university in order to make the apprenticeship a compelling and excellent scheme. This implementation, on the other hand, has the potential to establish a legal framework between apprentices, industries, and universities in areas such as whistleblowing, workplace discrimination, and sexual harassment. It can also explain the various issues and challenges encountered when enforcing apprenticeship rules and regulations. In this case, reaching an agreement on the best practice law for improving self-regulation during the apprenticeship is required.

4 Conclusion

The importance of dynamic capabilities in micro-enterprises was investigated in this paper. Micro enterprises are important because they create long-term employment opportunities and contribute to developing economies. In this regard, the government should focus more on assisting micro-enterprises to survive in a crisis. Furthermore, micro-enterprises must restructure their operations by implementing necessary improvements, such as digitization. This can be accomplished by collaborating with strategic partners such as Grab, Foodpanda, Shopee, Lazada, and others. In light of the fact that micro-enterprises are being forced to close their doors due to continuous losses as demand has declined, they must identify various alternatives that are appropriate for the critical situation. It is during a crisis that the full potential of micro-enterprises can

be realized. People are aware that the pandemic reduces the likelihood of micro-enterprises surviving; however, micro-enterprises can still make a massive comeback by adapting to market changes. It is therefore critical for micro-enterprises to have entrepreneurial leadership qualities in order for them to survive.

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Using Natural Language Processing to Detect Fake News

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Abstract. Over the last few years, the world has seen what feels like an explosion of fake news due to social media and technological advancements. Even though fake news is not a new phenomenon, it is one of the biggest challenges in our digitally connected world as it spreads like wildfire impacting a significant number of individuals daily. Social media platforms such as WhatsApp, Twitter, and Facebook allow for the distribution of fake news which can potentially impact the social, political, and economic aspects of the world as it becomes more prevalent presenting dire consequences. This research benchmarks multiple Natural Language Processing (NLP) classifiers against a common dataset to determine to what extent the classifiers can detect fake news. The research also introduces natural language features that can be used to better classify fake news. The dataset includes 12 836 short statements labelled for truthfulness, subject, context/venue, speaker, state, party and prior history. The sources used to collect the dataset include political debate, TV adverts, Facebook, Twitter, interviews, news release et cetera. The results show that the accuracy of a piece of an article being classified as fake news is based on the analysis of previously seen truthful and fake news. On this basis, an increase in more samples may help improve the results and should be considered when building a fake news classifier. The results also showed an improvement in classifying fake news when bespoke features are added to the classification of articles.

Keywords: Natural Language Processing, Fake News, Detection.

1 Introduction

The growing influence of the fake news phenomenon on social media is not exactly new, but the abundance of fake news has made it harder for an individual to discern the truth as every source of information needs to be fact-checked (Thorne & Vlachos, 2018). The Internet has empowered the spread of fake news by providing multiple low-cost dissemination channels (Pollicino, 2017). The posting of fake news on discussion forums, online journals, and social media platforms requires very little specialized skill, reaching immense crowds through the span of a couple of hours. Research on the reasons for the exponential growth of fake news on social platforms has focused on psychological measures (Roozenbeek et al., 2019) and fewer efforts on how it can be avoided or prevented. The change in the history of fake news is that previously only certain individuals could effectively spread fake news, nowadays anyone with Internet

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access can easily publish it (Tsfati et al., 2020). The scale of fake news in recent history has created an issue of being able to quickly classify and filter out fake news before it is consumed. The classification of fake news using short text is important to quickly filter out or flag potential fake news before it is consumed.

In order to improve current classification techniques, it would help to extract context from the articles to try to learn how fake news mostly exaggerates or misleads with highly inconsistent information. Fake news can be classified by leveraging a large array of language models that have been built. However, building such an algorithm poses challenges such as the ability to source both truthful and fake news examples, and being able to indicate if it is clearly genuine or fabricated news (Zhou et al., 2019). According to Conroy (2015) NLP accomplishes impressive precision on existing instances of manipulated news, this is achieved by checking if the news article conforms to standard norms and styles used by expert writers. The model can detect fake news when the content is completely different from the headline or when the article incorporates words viewed as being biased or provocative. However, by preserving the original subject matter and relating content closer to the headline without using bias or provocative words, the article can easily bypass detection. Despite the outcome that is generated by the model, online platforms still rely on manual work to segregate fake news from real news.

Based on the above one may argue that some form of fact-based knowledge must be adopted alongside NLP models in order to reduce the high rate of false positives, hence making this an area of research that requires further investigation (Zhou, Guan, Bhat, & Hsu, 2019). This research proposed a technological solution to an issue that was not necessarily constructed yet unquestionably intensified by digital platforms. NLP tools were used to build a fake news detection classifier. The methodology focuses on presenting a comparative performance analysis of existing methods and incorporating different features from existing works and investigating the performance of some successful text classification techniques. The LIAR dataset was used to address these issues. The LIAR dataset includes 12 836 short statements labelled for truthfulness, subject, context/venue, speaker, state, party, and prior history. The sources used to collect the dataset include political debate, TV adverts, Facebook, Twitter, interviews, news releases etc. A lengthy analysis report is provided by the labeller to ground each judgement, and the links to all the supporting documents are also provided (Wang, 2017). The LIAR dataset is used in this research particularly for a second challenge addressed by this research, which is the classification of short text for fake news. This research will address the notion that most social media posts on platforms like Twitter allow only for short tweets of 280 characters (Perez, 2018), and thus having a solution that is able to deal with these types of fake news important.

This research benchmarked multiple NLP classifiers against a common dataset to determine to what extent the classifiers can detect fake news. Although this is a field that has been explored, examining multiple NLP classifiers on a common dataset helps ensure that there is uniformity in the research and benchmarks the models on an even fit. For this reason, the main research question of this research is: *To what extent can an NLP classifier be used to detect fake news?*

The following section provides a brief background on fake news detection mechanisms and introduces different machine learning approaches, evaluation methods and models. Section three details the methodology followed in conducting the experiment. Section four and five presents the results of the evaluation and conclusions of the study.

2 Literature Review

2.1 Fake News Detection

Research that focused on detecting deceptive review opinions in sentiment analysis was conducted by (Fayazi et al., 2015). The study utilized a crowdsourcing approach that relies heavily on the wisdom of the crowd to vote if something is false or true where the majority vote is taken as the final answer. This method uses a swarm intelligence approach however has the drawback of a delayed classification, as you need people to slowly flag the fake news and by the time the detection is done it may be too late and people have acted on the misleading information. A key part of the research that can be reused is in how the training data set for a fake news detection model needs to use a swarm approach to better filter the noise and bias from the person labelling the training dataset. The use of ensemble methods in machine learning can be used to mimic this voting by crowds however this will be more effective as it does not require a waiting period for people to vote.

The headlines of a fake news article may intend to invoke emotion or physical response from the reader by having exaggerated text, while the text or content of the text is not aligned with the headline. A hybrid deep model for fake news detection which makes use of multiple kinds of features such as allocating a score to suspicious users was later proposed by (Ruchansky, 2017). The research by Ruchansky (2017) highlights the importance of building a historical view of authors and the articles they have written in order to build confidence and understanding of the type of articles they produce.

Technologies such as Artificial Intelligence (AI) and Natural Language Processing (NLP) tools offer great promise for researchers to build systems that could automatically detect fake news (Bondielli et al., 2019). Various machine learning approaches and algorithms as well as their key traits are introduced in the following sections.

2.2 Machine Learning Approaches

Machine learning is a subfield of AI that enables machines to improve at a given task with experience (Edgar & Manz, 2017). Early machine learning algorithms aimed to learn representations of basic functions. Consequently, the objective of learning was to yield a hypothesis that performed the correct classification of the training data, and early learning algorithms were intended to find such a precise fit to the data (Wittek, 2014). Modelling text brings forth many challenges as the text is known to be unstructured. Machine learning algorithms cannot work with the raw text directly; it requires well-defined fixed-length inputs and outputs and therefore the conversion of text into

vectors is imperative in order to reflect numerous linguistic properties of the text. A number of machine learning approaches exist and is briefly explained below.

Bag of words. Bag of words is a method used to represent text data when modelling, it is recognized for its great success in problems that involve language modelling and document classification (Tani et al., 2015).

Term Frequency-Inverse Document Frequency (TF-IDF). TF-IDF measures how frequently a word is used in a text. The advantage with TF-IDF is that it devalues stop words. The disadvantage is if the words are not normalized there is a likelihood that the scoring would be inaccurate (Yang et al., 2008).

Word2Vec. Word2vec creates vectors that are distributed numerically as representations of word features, such as the context of individual words. It does so without human intervention (Ayyadevara, 2019). The Word2Vec algorithm finds much more efficient representations by finding vectors that represent the words. These vectors also contain semantic information about the words. It groups similar words together in the vector-space by distinguishing similarities mathematically (Kang et al., 2019).

Global vector for Word Representation (GloVe). GloVe works by firstly creating a large word-context-co-occurrence matrix, consisting of (word, context) pairs in that each of the elements contained in the matrix represents how regular a word occurs with the context. The number of contexts needs to be large as it is essentially combinatorial in size. Subsequently, they factorize the matrix to yield a lower-dimensional matrix of words and features, where each line yields a vector representation for each word. It is accomplished by minimizing the reconstruction loss which searches for lower-dimensional representations that can clarify the difference in the high-dimensional data (Pennington et al., 2014). GloVe aims to take global information into account while learning dimensions of meaning. From this initial goal, GloVe builds up a principled method of training word vectors.

2.3 Evaluation Metrics

A number of machine learning evaluation metrics exist. Due to space constraint these metrics will only be briefly explained.

Area Under the Curve (AUC). Area under the curve (AUC) is used for binary classification problems and indicates how well the probabilities from the positive classes are separated from the negative classes. AUC is the area under the receiver operating characteristic (ROC) curve which constitutes of true positive rate, true negative rate and false positive rate classes (Huang et al., 2005).

Recall. Recall looks at the accuracy of the model by referring to the percentage of total relevant results correctly classified by the algorithm. How recall works is that it takes the number of true positives, divides it by the number of true positives plus the number of false negatives (Carterette, 2009).

Precision. Precision is a valid choice of evaluation metric when the aim is to predict accurately. Precision is defined as the number of true positives divided by the number of true positives plus the number of false positives (Goutte et al., 2005).

F1 Score. F1 Score is the Harmonic Mean between precision and recall for a classification problem. The range for F1 Score is $[0, 1]$ which gives an indication of how precise the classifier is; in other words, how many instances it classifies correctly, as well as how robust it is; that it does not miss a significant number of instances (Goutte et al. 2005).

Accuracy. The accuracy of a model is the ratio of correct predictions to the total number of input samples. It is suited for binary as well as a multiclass classification problem. Accuracy is a valid choice of evaluation for classification problems that are well balanced and not skewed (Hossin et al., 2015). Accuracy is a measure used to determine which model is best at identifying relationships and patterns between variables in a database based on the input data.

Matthew Correlation Coefficient (MCC). Essentially MCC is a correlation coefficient between the observed and predicted binary classifications which returns a value between -1 and + 1, where -1 indicates a disagreement between prediction and observation, 0 represents a random prediction while +1 is a perfect prediction. The coefficient accounts for true and false positives and negatives and can be used even where classes are of very different sizes (Zhu, 2020).

Cohen Kappa. Cohen Kappa was initially created to test inter-rater reliability, in the most recent decades, Cohen's kappa entered the machine learning space in order to compare classifiers' performances. Despite its ubiquity, in the learning setting, there are various issues causing the kappa measure to deliver questionable outcomes, for example, its high affectability to the dispersion of the minimal aggregates. Cohen's kappa statistic is a very good measure that can handle very well both multi-class and imbalanced class problems.

Cross Validation. Cross validation is a technique used to estimate the accuracy of machine learning models whereby the model is trained using a subset of the dataset and then evaluated using the complementary subset of the dataset. In building any machine learning model it is required that the problem be properly identified so that the most suitable algorithm is chosen so that it results in the best score (Hjorth, 2017). Both non-

exhaustive methods such as Holdout (Yadav et al., 2016) and K-fold cross validation (Meijer, 2013) exist, as well as exhaustive methods such as Leave-P-Out cross validation (Hibbert, 2017).

2.4 Machine Learning Models

The following machine learning models are available:

Logistic regression. This function was developed by statisticians to explain the properties of population growth in ecology as it was rising quickly and maxing out the carrying capacity of the environment (Menard, 2010).

Support Vector Machines (SVM). SVM is a supervised machine learning algorithm that can be applied for both classification and regression use-cases. SVM works by trying to find a hyperplane that best divides a dataset into two classes by vectorising each data point with several dimensions which equates to the number of the attributes that the model considers when classifying data. SVM aims to maximize predictive accuracy while avoiding overfitting to the data.

Tree Based Models. Tree based models are non-parametric supervised learning methods used for classification and regression. The objective is to create a model that predicts the estimation of an objective variable by taking in basic choice guidelines derived from the data features. Examples of tree-based models include Random forest (Xue et al, 2015), Gradient boosting algorithm (Wang et al, 2018), XGBoost (Chen et al, 2016) and Lightweight GBM (Machado et al, 2019).

3 Methodology

Multiple types of machine learning models were trained on the LIAR dataset using only the text field in the data. The models that performed the best on the dataset were selected based on their ability to properly classify fake or real news statements. The LIAR dataset has become the de-facto standard in modern fake news detection benchmarks and is publicly available. The dataset contains 12.8K manually labelled short statements in various contexts from Politifact¹, which provides detailed analysis reports and links to source documents for each case (Wang, 2017). After the dataset was collected various pre-processing methods were employed and some machine learning models were trained and evaluated on the data. The best performing models were measured on specific metrics such as accuracy, precision, recall, and F1 score. Further comparison between traditional NLP methods and deep learning context-based models was evaluated. The research were finalized by synthesizing and interpreting the results.

¹ <https://www.politifact.com>

4 Modelling Experiments and Results

This section briefly details (due to space constraint) the most important model training process and results and a summary of the evaluation results.

4.1 Model Training and Results

The initial round of models was used to build multiple base pipelines that worked to extract the statement field in the data and run it with TFDIF, GloVe, or Bespoke features as the initial step of pre-processing and feature extracting. The model that performed the best was the GloVe Random Forest as it showed the highest F1 Score, at 38%. A major problem that was observed with most of the models in the first modelling approach is that the scoring difference between the training and testing was so vastly different. It was clear that the highly complex models are overfitting the dataset and that good generalized models need to be found. This then informed the approach for the second round of modelling which focused more on a cross validation type of training which ensured that the model generalizes across multiple samples of the data.

Given the results from the initial model, GloVe emerged as a text feature extraction mechanism was a good way of getting meaning from the data. All the models were then trained on a combination of GloVe and Bespoke features that were created for this project. Given the large dimensions of the GloVe vector for each document which was 96 elements in size, dimensionality reduction using UMAP (Uniform Manifold Approximation and Projection for Dimension Reduction) was also employed (McInnes et al., 2018). This resulted in a training set that had 49 features which comprised of 39 bespoke features and 10 components from the redacted GloVe features using UMAP. Part of the pre-processing of the data is the creation of new features based on interactions between features and polynomial features that create combinations of features. This expands the data set to 341 features, for the sake of simplicity where it will only cover these features if they appear in the top 15 features list.

5-Fold cross validation was employed and included the LIAR datasets validation set in the overall dataset. The 5-Fold cross validation will be based on 80% of data with a 20% unseen dataset for us to use for evaluation purposes. After preparing all this data for training, the dataset was ran across multiple models.

When using the dataset in the second approach, it was seen that the tree-based ensemble methods are the best models at classifying the dataset. The results from the mean 5-fold cross validation scores showed more stable results. The best model being Gradient Boosting Machine with an AUC of 61% which is 11% higher than a random model.

From the top models, hyperparameter tuning using a grid search was used to tune the models.

After tuning the models, the top model was benchmarked. This was done by training on instances of the model on each fold and testing out the results. The performance of the top model was tested on the unseen data.

Table 1. Validation Results

Model	Accu- racy	AUC	Recall	Prec.	F1	Kappa	MCC
Gradient Boosting Classifier	0.6451	0.6012	0.1015	0.503	0.1689	0.0563	0.0857
Bagging Classifier	0.6751	0.7404	0.1259	0.7574	0.2159	0.1275	0.2105

The model performed very much consistent with how it performed on the training set. This makes it a very stable method as the training cross validation score matches the unseen validation data.

Using a bagging model significantly improves the performance of the model as the model's results jumped to 74% AUC with an improved MCC as well as F1 Score. The results of both these models are illustrated in Table 1.

4.2 Summarizing Evaluation Results

From the models in the first stage, it was observed that the first benchmarks look like and the results that can be achieved with TFIDF vs GloVe vs GloVe UMAP. Using TFIDF, it was shown that simplistic models can extract more meaning from the data where more complex models and mainly the three based models seem to over-fit especially when using the default settings and underperform on the dataset. Given that there is little text in the statements made in the LIAR dataset it would make sense that the model should not be highly complex as this may generate very highly biased models that would not give the best results. Model performance was also evaluated when the GloVe embeddings are used on the data. In the second approach, a more streamlined approach was followed by using the same pre-processing technique which showed great success in the first round which was the GloVe+UMAP+Bespoke feature approach. The Bespoke method tied in the use of text generated, entity-based features, and sentiment-based features. In this approach, a wider range of models were considered and their performance were evaluated from mean 4-fold cross validation. The best model was selected by using the AUC as a metric. To see if that model could be improved further, the bagging approach was employed by using 10 versions of the top model and training them as voting classifiers. This improved the results significantly to 74% AUC. The resulting model was able to classify short text in the LIAR dataset as Fake or Real. The shortcomings of this model are:

- **Text Length:** The LIAR dataset is based on very short texts and this task would be even hard for a human to do without context.
- **Using just Text:** Most attempts at training a classifier on the LIAR dataset do this by using all fields in the dataset. The proposed model will classify fake news solely based on text.
- **Data Gap:** Although the dataset is extensive it would be helpful if the dataset was much larger

5 Research Findings and Conclusion

From the previous section, it emerged that the GBM model was the best model. The model's parameters are as follows:

```
GradientBoostingClassifier (ccp_alpha=0.0, criterion='friedman_mse', init=None,
learning_rate=0.1, loss='deviance', max_depth=3,
max_features=None, max_leaf_nodes=None,
min_impurity_decrease=0.0, min_impurity_split=None,
min_samples_leaf=1, min_samples_split=2,
min_weight_fraction_leaf=0.0, n_estimators=100,
n_iter_no_change=None, presort='deprecated',
random_state=6387, subsample=1.0, tol=0.0001,
validation_fraction=0.1, verbose=0,
warm_start=False)
```

The model has a maximum depth of 3 which shows that the model creates a very simplistic relationship within the data. This is the main metric that emerged when considering the parameters. It supported the notion that given the short text found in the LIAR dataset it would make sense that the models that do draw inference from this data are too complex. The maximum depths ensure that the relationships are not too complex. From the results of the model, it showed that the GBM model has a cross validation AUC mean of 60% and this can be seen from the ROC Curve shown in Fig 1.

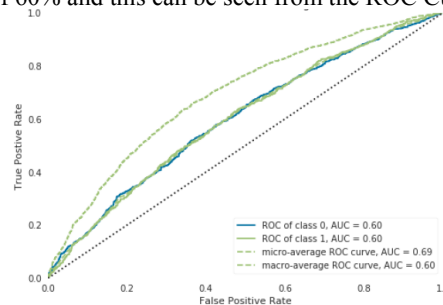


Fig. 1. ROC for Gradient boosting classifier

The model performance was evaluated across other metrics which show that the model has a hard time classifying documents as fake or real. This is to be expected as most of the text looks the same in the statements of the LIAR dataset. The model seems more conservative in predicting fake news and this is given that fake news is the minor class in the fake news or fake statement problem.

The precision-recall curve was explored to determine the trade-off between precision and recall for different thresholds. The models show a high precision which gives the view that the model has a relatively low false-positive rate which helps ensure that the model is precise about its prediction of a fake statement.

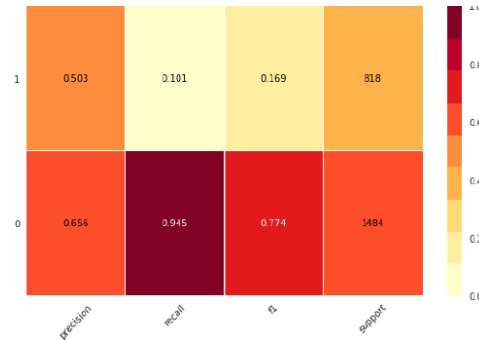


Fig. 2. GBM classification matrix

The chart below shows the average precision to be around 44%.

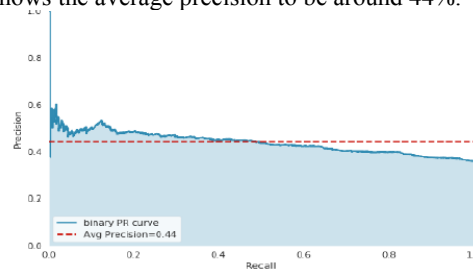


Fig. 3. Precision-Recall Curve for Gradient Boosting Classifier

In response to the research question, the literature presented in section 2 indicates that NLP is being used as a means to detect fake news. This research, proposed steps to extract information from text and use machine learning to classify text into fake or real news. Section 4 briefly detailed the results of the experiment to evaluate the best model to achieve this.

This research highlighted that the best way to discern if a model is doing well or not is by comparing the different types of metrics. Cross validating was added to ensure that the models' output was not being affected by sample bias and that the key results derived from the model were a genuine performance.

Pipeline and pre-processing steps were proposed to train the models. The final model structure showed the most promising results, which was to use GloVe word embedding with bespoke features. This incorporated the notion that to classify if an article is fake or not you have to understand how something was said using the bespoke text features by getting a numerical GloVe embedding of the text. A major drawback was the length of text found in the LIAR dataset. The text is rather short and does not give the model too much to work with, however, this is also an advantage of the model as learning from short text mimics a lot about today's society in the world of social media where fake news can be shared by a single tweet. Although complex, this research serves as a first view of what is possible with using just short text to classify fake news.

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Flexible Workforce Management. An exploratory Study

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Abstract. A flexible workforce is a key competitive advantage to deal with a constantly changing environment, such as order fluctuations and filling knowledge gaps due to a shortage of skilled staff. So far, only few empirical results are available on how companies successfully manage the “Flexible Workforce”. In the present exploratory study, we examine the flexible workforce practice and management in Swiss organisations using a quantitative approach. Data were collected through an online survey, in which 224 HR professionals of Swiss companies took part. The results suggest that organisations engaging in a flexible workforce benefit from outcomes like dealing with peaks in workload, filling knowledge gaps, implementation of new ideas and succession planning. The extent to which companies can benefit from the use of a flexible workforce depends, among other things, on the complexity of the tasks and organisational characteristics such as the culture of trust and the practice of knowledge management.

Keywords: Flexible Workforce Management · Contingent Worker · External Flexibility · Survey

1 Introduction

The world of business is changing and the shape of the workforce with it [1]. Organisations must be flexible to be successful in the fourth industrial revolution. Organisations change to become more flexible and in order for organisations to be flexible, a flexible workforce might be a good option [2].

Already since the mid-70s [3], organisations have been interested in flexible organisations and alternative work arrangements to face challenges like uncertainty, technological change like the spread of the internet, globalisation or market stagnation [4-6]. Back then, Lynch [5] claimed organisational flexibility is not an option but a necessity. This is still true more than 30 years later. Flexibility gains momentum in the course of the debate about so-called “megatrends” [7]. Technology, demography and globalisation are drivers for the future of work [6] and underlie the need for organisations to have greater flexibility of employment systems [8]. Organisations see flexibility potential increasingly within the organisation’s human resources [9]. A sustainable fit in dynamic and competitive environments can only be achieved by a flexible organisation,

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which is also part of strategic HRM to promote [10]. Kalleberg [8] further emphasises the importance of human resources practices that enable organisations to adapt quickly to social and economic changes.

At the same time, there are not only positive but also negative voices with regards to flexibility [11]. The concept of flexibility is discussed controversially in terms of negative effects on employees and society [12]. Part of the problem might be the wide use of the term flexibility and lack of specification or assuming only one-sided benefits [12]. Paradoxically, flexibility from the organisations' perspective might lead to restrictions from the employee's perspective and vice versa [11]. There is a distinction between having flexibility or being flexible [13], with typically the organisation having flexibility and the employee being flexible [11]. Reilly [12] argues that of course there are some areas with benefits for one side only, however, there are also areas where benefits for both parties exist, for example multi-skilling: Organisations may benefit from improved productivity and employees from enhanced skills [12].

Yet, there is still only little research on flexibility strategies resulting in mutual advantages for both employees and organisations.

The aim of the present study with an exploratory character is to gain insights into labour flexibility strategies of Swiss organisations, analysing potential flexibility benefits and dipping deeper into success factors for the management of a blended workforce. The results of the study might provide a starting point for HR professionals to strengthen flexible workforce practice in Swiss organisations.

2 Flexible Workforce

2.1 Strategies of Labour Flexibility

Flexibility can be described as “a firm's abilities to respond to various demands from dynamic competitive environments” [14]. It is the ability of a firm to adapt to environmental changes by quickly reconfiguring activities and resources [10]. Based on this definition and from an organisational perspective, labour flexibility relates to the allocation of the workforce in accordance with varying requirements of production and customers [11]. For an organisation to be flexible, a flexible workforce might be a good option [2]. Researchers have focused on two different flexible labour utilisation strategies [8]: internal vs. external flexibility [15] functional vs. numerical flexibility [4,12], organisation-focused vs. job-focused [16] or resource vs. coordination flexibility [14]. Either organisations focus on the ability of employees to perform a variety of different jobs or limit the involvement of employees within the organisation by hiring temporary employees [8]. Coordination flexibility, external flexibility, job-focus flexibility or numerical flexibility describe the use of external employment to enhance firm performance and allow organisations to reconfigure, resynthesize and redeploy human capital as needed [17]. Resource flexibility, internal flexibility, organisation-focused or functional flexibility describe the flexibility based on the existing pool of human resources in an organisation [9] and the encouragement of employees to adopt to expandable work roles [18]. It is about enhancing employees' skills to perform a variety of different jobs [8].

Workforce planning appears to be one of the top challenges for organisations [19] and labour flexibility became an increasingly important research topic in the past years [20].

2.2 The Flexible Firm

In the past, studies primarily focused on either one or the other flexible labour utility strategy [8]. Concerning functional flexibility, scholars described correlates of high-performance work systems [8] as well as positive outcomes on labour productivity and innovation performance of organisations [21], and reduced involuntary and voluntary turnover [15]. However, organisations seem to prefer numerical flexibility [21]. Research on numerical flexibility was mainly about cost reduction and increased competitiveness through externalisation [8] or effects on employees [22-25]. However, only a few studies focused on the interplay between functional and numerical flexibility [8] like the “flexible firm”. The “flexible firm” or the core-periphery model is the most popular model combining both flexibility strategies and was introduced by Atkinson [4]. However it is criticised for mainly focusing on an accurate representation of numerical and functional flexibility and for being too narrow [8]. In addition, it meets mainly the needs of organisations with many low-skilled but not high-skilled employees [26]. There are other studies regarding blended workforce models [27,10] but these are criticised for primarily focusing on economic benefits for organisations [11].

2.3 Flexible Employees

In 2019, more than 26 million employees in the European Union were temporary employees [28]. Temporary engagement as part of flexible work arrangements are likely to play an increasingly important role in the future [29]. However, labour market theorists are sceptical about this development [30]. The accusation arises that in case of flexible employment relationships, contingent workers bear the costs in the form of fragile employment biographies [25]. The loss of stability, short-term employment, uncertain future prospects and financial uncertainties are seen as problematic [31]. On the other side it is argued that contingent work does not necessarily lead to precarious biographies [32,30]. Contingent employment plays an important role concerning labour market integration [7,33] and reduces the risk of long-term unemployment [32]. Flexible work is trendy and an increasing number of employees consciously decide to work as contingent workers [34].

Overall, the research focus of flexibility strategies seems to be more on the employee side and less on the organisational side [19]. Besides the studies about organisational flexibility from an organisational perspective and concerning the “flexible firm”, a large body of research about organisation flexibility focused on the socio-economic level and dealt mostly with discussions about flexibility and precarious employment [35,36,12,13,23,37]. In addition, platform economy and gig economy are among the very trending research topics [38-40] in terms of numerical flexibility.

Yet, there is only limited research on flexible workforce strategies and practices, especially with a focus on Swiss organisations.

With the present study, we intend to examine the flexible workforce management of Swiss organisation to make a first, exploratory step to close the research gap. Within the framework of this study, we start by focusing on external flexibility. The study was guided by the question of how Swiss companies deploy contingent workers in the company, what strategies they are following in this regard and what advantages they can benefit from.

3 Method

3.1 Sample

In total, the final sample included 224 participants indicating that they work with contingent workers in their organisation: 66% females and 34% males contributed to the study. 80% of the participants worked in HR, 22% were members of the Management Board, owner or CEO of the company and 10% worked in another division of the company (multiple answers possible). 41% of the respondents indicate their function as HR Director, 16% as HR Manager, 12% as Managing Director and 12% as HR Business Partner, 11% as HR Specialist and 8% work in other functions. With regards to professional experience, 49% have more than 20 years, 34% have 10 to 20 years and 9% have 8 to 10 years of professional experience. Due to this response, it is assumed that the respondents are experts in the respective companies and were able to give well-founded information about the management of the flexible workforce in their organisations. Slightly more than half of the respondents (53%) work in large companies (250 and more employees), 23% in medium-sized enterprises (50-249 employees) and 12% each in small (10-49 employees) and micro enterprises (1-9 employees).

3.2 Measures

The questionnaire included almost 70 content-related questions about flexible workforce management and 10 questions regarding descriptive data. Since we did not find adequate scales measuring a flexible workforce, new items have been formulated. The survey was split into four parts: the deployment of contingent workers, the Flexible Workforce Management, the integration, collaboration, leadership and culture contingent workers face in the organisations, as well as advantages organisations benefit from by working with a contingency workforce.

3.3 Procedure

The University of Applied Sciences Northwestern Switzerland FHNW conducted the study in cooperation with HR Today, the largest Swiss HR magazine. Data gathering was obtained through a questionnaire distributed to a wide group of HR professionals. The questionnaire was distributed in summer 2020. Participants of the given random

sample completed the questionnaire online through an online survey service. The survey was promoted through HR Today, social media channels and business networks. The survey was distributed to subscribers of the HR Today newsletter, through social media channels and company networks. Furthermore, the survey was sent to alumni of selected further education programmes of the University of Applied Sciences Northwestern Switzerland FHNW.

4 Results

To describe the results, different types of statistical indicators and forms of visualisation were used, such as frequencies, tables and charts. To determine the correlations, we performed bivariate correlations (Spearman correlation tests). All statistical analyses were performed using IBM SPSS software. The tables and diagrams were created in Microsoft Excel. Prior to the assessment of the data, we reverse-coded negatively keyed items.

4.1 Descriptive Statistics

Descriptive results indicate that most of the surveyed organisations work with a very small number of contingent workers (see Figure 1). More than half of the participants (52%) indicate that only 5% or less are contingent workers in their organisation. In 23% of the companies, between 5% and 10% additional contingent workers work there. Only a small proportion of the respondents (6%) work with more than 50% contingent workers in addition to their permanent workforce. Three quarters of these are small or micro enterprises.

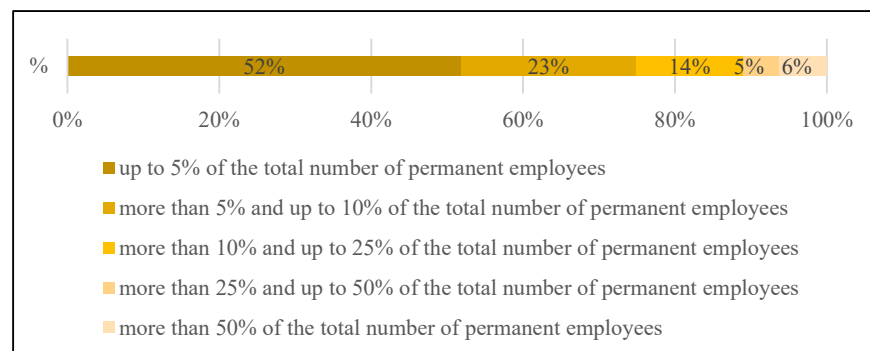


Fig. 1. Number of contingent workers in addition to the total number of permanent employees (N=191).

The majority of companies hire contingent workers for complex tasks (77%). 57% of the respondents benefit from contingent workers for simple tasks. In 34% of the cases, participants indicate that contingent workers handle both simple and complex tasks. Figure 2 indicates that most of the companies engage contingent workers for project-related assignments as well as for specialised tasks. In 47% of the companies, contingent workers form a continuous part of the organisational workforce.

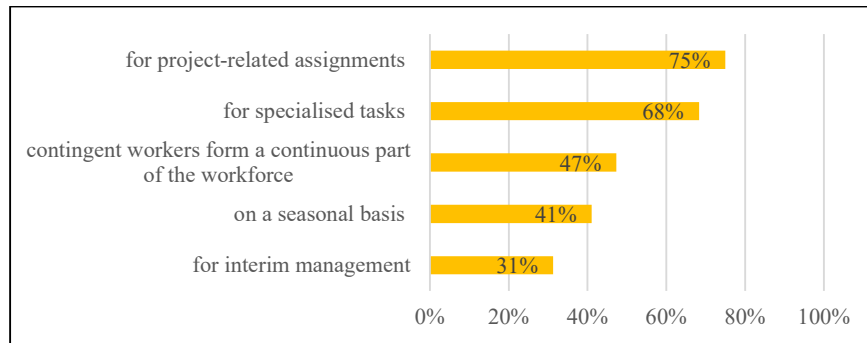


Fig. 2. Tasks for which contingent workers are deployed (N=224; multiple answers possible).

Companies working together with contingent workers benefit from different advantages (see Figure 3). For 81% of the companies, the main benefit is dealing with workload peaks. Filling of knowledge or skills gaps is also an important reward of contingent workers (more than 50% agreement). Remarkably, the reduction of personnel costs through contingent workers does not seem to be a central advantage for a large part of the surveyed companies. Furthermore, respondents were asked about the implementation of new ideas and about the selection of employees from the contingent worker pool. For these questions, the results are rather balanced.

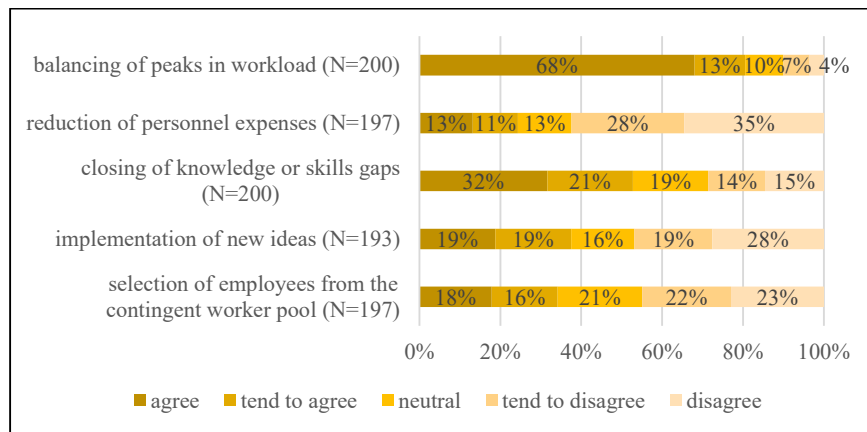


Fig. 3. Advantages through the deployment of contingent workers.

4.2 Bivariate Correlations

In addition to descriptive statistics, we investigated correlations between the above presented benefits and conditions of the company like task complexity level, organisational characteristics, and instruments.

Type of Task

Depending on how contingent workers are engaged, companies benefit from different advantages. The data shows that companies that use contingent workers for simple tasks can benefit from balancing peaks in workload (see Table 1). Companies that deploy contingent workers for complex or specialised tasks as well as for project-related assignments are more likely to succeed in filling their knowledge and competence gaps and to implement new ideas. The same applies to companies with contingent workers for interim management. In addition to the above-mentioned advantages, these companies are also able to reduce personnel costs and gain contingent workers for succession planning. Companies hiring contingent workers on a seasonal basis mainly succeed in covering workload peaks. The picture is somewhat different for organisations in which contingent workers form a continuous part of the workforce. Except for filling knowledge or skills gaps, these companies benefit from all of the examined advantages.

Table 1. Benefits of companies that use a contingent workforce depending on the type of task (Spearman correlations).

Companies that hire contingent workers...	...can benefit from				
	the balancing of peaks in workload	the reduction of personnel expenses	the closing of knowledge or skills gaps	the implementation of new ideas	the selection of suitable employees
...for simple tasks	0.34***				
...for complex tasks			0.50***	0.39***	
...for specialised tasks			0.44***	0.42***	
...for project-related assignments			0.34***	0.34***	
...for interim management		0.17*	0.25***	0.27***	0.21**
...on a seasonal basis	0.31***				
...as a continuous part of the organisational workforce	0.19*	0.21**		0.21**	0.25***

Organisational Characteristics

The results show that certain organisational characteristics are associated with greater use of benefits (see Table 2). Companies in which employees trust each other and share their knowledge are particularly successful in dealing with workload peaks through contingent workers. Inviting contingent workers to important meetings also seems to be relevant, because it appears to allow knowledge or skills gaps to be covered, as well as implementing new ideas. The same is true in companies that are concerned about keeping the knowledge of contingent workers within the firm.

Table 2. Organisational characteristics and how companies benefit from flexible workforce management (Spearman correlations).

Companies in which...	...can benefit from				
	the balancing of peaks in workload	the reduction of personnel expenses	the closing of knowledge or skills gaps	the implementation of new ideas	the selection of suitable employees
...trust between permanent employees is high	0.28***				
...a culture of knowledge sharing exists	0.23**				
...contingent workers are included in important meetings			0.20*	0.20*	
...the knowledge of contingent workers is adequately secured			0.18*	0.23**	

Instruments for Flexible Workforce Management

In addition to the organisational-specific characteristics, there are also aspects of flexible workforce management that can be influenced by the HRM department (see Table 3). Companies in which the recruitment process for contingent workers is aligned between HRM and other departments succeed in balancing workload peaks. Organisations that have defined processes for the deployment of contingent workers benefit from the same advantage. Companies using tools to identify contingent employees or include contingent workers in personnel planning tools benefit from the reduction of personnel costs. Organisations that have specific employer marketing for contingent workers in place or provide measures to maintain relationships with contingent workers benefit from the same. Surveyed companies who indicate that they have a designated "FlexManager", who is mainly responsible for the management of the Flexible Workforce, can not only reduce personnel costs, but also adjust for peaks in workload. Moreover, they are more successful in gaining contingent workers for permanent positions. The latter advantage also applies to companies that offer contingent workers access to training and further education.

Table 3. Instruments for FlexWork Management and how companies benefit from the HR instruments of flexible workforce management (Spearman correlations).

Companies in which...	...can benefit from				
	the balancing of peaks in workload	the reduction of personnel expenses	the closing of knowledge or skills gaps	the implementation of new ideas	the selection of suitable employees
...the coordination between the HRM department and other departments involved in the search for contingent workers is good	0.18*				
...processes for the deployment of contingent workers are defined	0.16*				
...procedures or tools to identify flexible workforce resources are used		0.20*			
...contingent workers are included in personnel planning tools		0.22**			
...an employer marketing programme for contingent workers is carried out		0.18*			
...measures are in place to maintain relations with contingent workers		0.23**			
...there is one person (or several persons) whose main task is flexible workforce management ("FlexManager")	0.19*	0.21**			0.15*
...contingent workers have access to training and further education					0.23**

5 Discussion and Conclusion

5.1 Strategies and benefits of Flexible Workforce

The current explorative study examined external labour flexibility utilisation patterns in Swiss organisations and intended to investigate effects on organisation-related outcomes. The majority of organisations rely on a flexible workforce. Contingent workers are a consistent part of the workforce, albeit in rather small numbers. In general, organisations profit from dealing with peaks in workload, filling knowledge gaps, implementation of new ideas and succession planning. Interestingly, we found that the benefits depend on the contingent workers' task complexity. We identified two distinct rewards: for low-level tasks, organisations mainly benefit from dealing with peaks in workload. For high-level and complex tasks, organisations take advantage of filling knowledge gaps and implementing new ideas. Even though the reduction of personnel costs seems to be a main reason to hire contingent workers, we did not find evidence that it is also the main benefit. The extent to which companies can benefit from the use of a flexible workforce depends, among other things, on the complexity of the tasks and organisational characteristics such as the culture of trust and the practice of knowledge management.

5.2 Implications

Our results indicate that professional flexible workforce management might be necessary to profit from the full potential of a flexible workforce. We highly recommend organisations to think beyond existing models and to develop an integrated view regarding HR strategies and processes for managing a blended workforce including the idea to introduce a designated “FlexManager”, who is responsible for the management of a flexible workforce.

With regard to HR practices, we propose that a success factor for a flexible workforce practice resulting in benefits for both organisations and employees might be a holistic management of the blended workforce including an integrated view on workforce planning and HR processes.

Contingent employees might benefit from such an approach because it would include contingent workers in organisational processes, developing instruments for the management of contingent workers and establishing a culture and environment where contingent workers feel trusted, included and welcomed. This might also improve the employability of contingent workers.

5.3 Limitations and Future Research

There are limitations to this study that guide future research. The exploratory character of the study was important to get a very general idea about flexible workforce practices of HR professionals in Swiss organisations. However, the exploratory design is also a limitation of our study since it does not allow for the generalisability of claims. Further research would benefit from a more hypothesis-driven quantitative approach to investigate the effects of a flexible workforce management on organisational and psychological outcomes.

Second, we only focused on one of the two flexible labour utility strategies: external flexibility. Further research would benefit from also including internal flexibility and a focus on the interplay between both strategies.

In addition, we suggest further investigating and identifying indicators allowing a flexible workforce risk and opportunity assessment from both perspectives, flexible employees and organisations. A currently launched research project explores these issues in companies in the finance, health care and mobility sector.

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Sustainable Business Model Innovation for Society 5.0: Towards a Collaborative, Inter- and Transdisciplinary Approach with Students and Organizations

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Abstract. Digital transformation and sustainability are but two developments in a society 5.0 that challenge businesses to rethink their business models. Sustainable business model innovation should enable companies to operate within planetary boundaries while ensuring their long-term success. Following a design-based approach, this action-oriented research addresses how higher education institutions can offer educational initiatives that strengthen students' and organizations' capabilities for sustainable business model innovation. This paper confirms and addresses the need for more research on collaborative, inter- and transdisciplinary educational approaches for sustainable business model innovation with students and organizations.

Keywords: Sustainable Business Model Innovation, Higher Education, Know-How Transfer, Action-Oriented Learning

1 Introduction

Society 5.0 envisions a sustainable, inclusive socio-economic society powered by digital technologies [1]. The vision highlights two key developments that raise considerable challenges and opportunities for organizations: digital transformation and sustainability. Digital technologies have fundamentally changed how we work and interact, especially seen during the COVID19 pandemic [2]. However, although many positive aspects have been hailed, these changes have also raised considerable debates around their social, ethical, and political implications [3]. On the other hand, mounting concerns over environmental and social issues have argued for a monumental shift towards increasing sustainability [4,5], calling for businesses to move beyond the pursuit of

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mere profit maximization. These developments have made it imperative for organizations to rethink their business models to not only ensure long-term competitiveness but also contribute to solving societal issues [6,7].

Successful business model innovation goes beyond product, service, and technological innovation to transform how business is done [6]. Within this context, the importance of sustainable business model innovation (SBMI) has increased and should enable companies to operate within planetary boundaries [5,8], increase their competitive advantage, and improve their internal capabilities for innovation and change. However, SBMI depends heavily on harnessing the collective capabilities of diverse stakeholders and the quality of local institutions and ecosystems [7]. In this line, collaborative, inter- and transdisciplinary innovation approaches have become increasingly important. This emphasizes a need for fundamental changes in existing innovation practices and may unearth organizational or cognitive barriers [9]. Furthermore, given the transformations needed to move towards true sustainability and the bounty of ethical considerations that accompany the use of digital technologies [3], a critical reflection is required on the mental models that underscore traditional “business as usual” approaches.

Current research on SBMI acknowledges a need for more research into how organizations can transition to more sustainable business models [6,7] and the appropriate tools and processes to support them [7,10]. Consequently, research in these areas has increased [6,7,11]. However, one area that remains under researched is the educational facet in supporting organizations in such transitions [12]. Higher education institutions (HEIs) can play a significant role in helping organizations meet the challenges of SBMI [13]. On the one hand, by educating responsible future leaders [14] who see business as a means to transform and serve society [15]. On the other hand, by providing spaces for creative experimentation in collaboration with industry to benefit both student learning and businesses’ innovation capability [16]. Although several learning collaborations and formats between HEIs and organizations exist, only a few give specific focus to SBMI [12]. SBMI strongly calls for inter- and transdisciplinary approaches that are biased towards action and learning by doing and while the literature on *Higher Education for Sustainable Development* (HESD) contributes greatly to competences and learning methods [17,18]. What appears insufficiently addressed is research on the practical implementation thereof for SBMI.

Therefore, our action-oriented research project aims to provide practical insights on appropriate educational initiatives for collaborative, inter- and transdisciplinary SBMI with students and organizations. This research contributes to practice and the literature streams of SBMI and HESD. Spread over five phases, we investigate the formats, content, processes, and success factors of existing initiatives. With the information obtained, pilot projects are developed to experiment and unpack further insights. The remainder of this paper is structured as follows. Section 2 describes the key theoretical concepts relevant to this project. Section 3 introduces the project, the research design, and the preliminary results of the project’s first phase. Section 4 concludes this paper.

2 Key Concepts

2.1 From Business Models to Sustainable Business Model Innovation

Business Models. Although *Business Models* (BM) and *Business Model Innovation* (BMI) have grown into a robust body of knowledge over the last 15 years, the theory is still in a consolidation period with some conceptual inconsistencies and ambiguity [6,19]. In essence, a business model (BM) explains how business is conducted and “describes the design or architecture of the value creation, delivery and capture mechanisms” of a firm [20 p.191]. A BM is often depicted in an overarching concept comprised of the business’s different components [20-23]. The extant literature provides many representations emphasizing a lack of consensus about what a BM consists of [24]. One of the most referenced, *The Business Model Canvas* (BMC), considers nine blocks for value creation [25]. Further well-known examples include the 7-Keys model of the University of Applied Sciences Northwestern Switzerland (FHNW) [26], and Gassmann et al.’s [22] conceptualization with four central dimensions: The Customer (Who), the value proposition (What), the value chain (How), and the profit mechanism (Why). On the rise are depictions that include social and ecological considerations such as the *Sustainable Business Canvas* (SBC) [27]. A BM, however, consists not only of its components but also the linkages and interactions among them [28]. Table 1 provides a comparison of the four mentioned forms of representation and their components.

Table 1. Comparison of Selected Business Model Representations and their Key Components.

<i>BMI</i> Gassmann et al. [22]	<i>BMC</i> Osterwalder et al. [25]	<i>7-Keys Model</i> Meyer & Tavic [26]	<i>SBC</i> Tiemann & Fichter [27]
Who?	Customers	Customers	Vision & Mission with Social & Environmental Goals Customers Competitors Other Stakeholders
What?	Value Proposition	Products & Services Competition	Value Proposition
How?	Sales Channels Customer Relationships Key Partners Key Activities Key Resources	Market Development Resources	Key Partnerships Key Activities Key Resources
Why?	Cost Structure Revenue Streams	Money Person/Team	Cost Structure Revenue Model

Evident in Table 1 is that the focus of the first three representations remains more closely on the organization as the main object. In contrast, the SBC acknowledges the business as embedded in a bigger context, including social and ecological considerations and with broader stakeholder involvement.

Business Model Innovation. Rapid technological advances and resulting competitive pressures have pushed *Business Model Innovation* (BMI) to the top of management and academic agendas [6,29]. BMI refers to the process of altering a BM in response to internal and external incentives by developing, diversifying, acquiring, or transforming it [6, 7]. Innovating a BM differs from product or process innovation in that it significantly affects at least two dimensions [30]. BMI, according to Foss and Saebi [6], is a dynamic process that may occur in varying degrees of intensity, depending on the degree of innovation implemented, such as new to the firm or new to the market, or the extent of the changes, such as individual components or systemic/architectural structure. Successful BMI generates value for customers, various stakeholders in the ecosystem and captures value for the firm [30]. However, BMI presents a challenge for firms, and organizational or cognitive barriers may arise [9]. Organizational barriers may be linked to resource allocation, complexities surrounding BM development parallel to existing BMs, or inertia triggered by concerns about the efficacy of new BMs [9,24]. Managers' ability to imagine or identify alternative BMs, and their knowledge of the critical systems, skills, or processes, may be hindered by cognitive barriers [9,24].

Sustainable Business Model Innovation. Mounting concerns over social and environmental issues have led governments, investors, companies, and civil society's growing interest in sustainability. To the good of current and future generations, sustainability envisions a balanced convergence of economic performance, social inclusion, and environmental resilience [31].

Consequently, Sustainable Business Model Innovation (SBMI) has received increasing attention [7,32] which involves *“the analysis and planning of transformations to a more sustainable business model or from one sustainable business model to another. This comprises both the development of an entirely new business model and the transformation of an existing business model”* [7 p.409]. In this context Sustainable Business Models (SBMs) have been defined as boundary-spanning and interactive systems [10], which according to Geissdoerfer et al. [7] *“incorporate pro-active multi-stakeholder management, the creation of monetary and non-monetary value for a broad range of stakeholders and hold a long-term perspective”* [7 p.403]. SBMI, therefore, builds on traditional BMI but applies to an extended context, incorporating sustainability as guidelines for BM design, and seeks to contribute positively to the environment and society in addition to capturing economic value [19,33,34]. Several SBMIs have emerged, and a few examples include circular-, regenerative-, decarbonized-, equity-focused-, local- or degrowth-inspired BMs [35].

Companies are increasingly recognizing that sustainability can be a source of innovation and competitive advantage. Geissdoerfer et al. [7] go as far as to argue that the comprehensive advantages SBMs offer organizations will ultimately render the concept of non-sustainable BMs obsolete. The challenge, however, lies in considering a broader context and moving beyond incremental innovations such as technological innovations or operational changes that reduce cost and risk to more radical organizational, institutional, and social innovations [36]. To this end, researchers have called for more research into how organizations can transition to more SBMs [6,7] and the appropriate tools and processes to support them [7,10].

2.2 Process & Tools for Sustainable Business Model Innovation

A shared understanding of what constitutes SBMs and how they can be developed is still lacking [10]. However, in recent works, the innovation process has evolved from what was initially conceived as a linear, step-by-step process to a more dynamic and systemic process involving different iterative phases [6,10,12,36]. Characterized by some as discovery-driven, the process also emphasizes the need for experimentation and ongoing learning by doing [12,37,38] and the need for collaboration and inclusion of various actors in the business model ecosystem [10,36,39,40]. In fact, although challenging, the need for even more diverse stakeholders to come together in efficient and effective networks is seen as one of the specific necessities for SBMI [10,36]. Thereby increasing the need to use systems thinking and stakeholder discovery to expand the business canvas and better understand the broader context.

To complement the process of SBMI, the literature provides a variety of tools for analyzing and developing BMs. Prior research has emphasized their roles in creating shared conceptualizations and enabling communication between the stakeholders involved in BMI [40]. Tools can be broadly understood as techniques, methods, frameworks, and approaches that support decision-making in BMI [40] and facilitate various activities such as BM exploration, design, testing, implementation, or growth [41]. One of the most widely known and used tools is the business model canvas [23], a simple and intuitive tool used to describe and think through the different elements of a business model. With increasing importance placed on digitalization and sustainability to ensure firms' future fitness and positive contributions to society, several variations and additional tools have surfaced to focus more on SBMI. There has, however, been a lack of clarification on where existing tools for conventional BMs are adequate and where new tools are needed for embedding sustainability in BMI [42].

Nonetheless, Pieroni et al. [19] found that SBMI approaches are becoming more heterogeneous, relying on multiple theories that deviate from the more traditional view depicted in the BM canvas. Pieroni et al. [19] systematized a comprehensive collection of conceptual frameworks, methods, and tools currently available to support BMI towards sustainability. Based on Teece's [43] dynamic capabilities view, Pieroni et al. [19] differentiate the functional role of these methods and tools into ones that can be used to help identify opportunities for new BMs (sensing), be applied for designing and testing new BM concepts for sustainability (seizing) or can support experimenting, testing, and implementing the business model concepts (transforming). However, there appears to be still a lack of methods or tools for the latter "transforming" role [19], and many existing tools remain unused due to their increased complexity, resource requirements, or context-specificity [44].

Nonetheless, it can be deduced that successful SBMI requires diverse stakeholder involvement in a dynamic, iterative process that allows for experimentation and learning by doing. Therefore, the literature emphasizes tools that support organizations' dynamic capabilities to adapt and develop BMs and embed sustainability throughout the process. As an orientation, Breuer et al. [10] provide the following set (Table 2) of guiding principles and process-related criteria to inform the choice or design of processes and tools for SBMI.

Table 2. Guiding Principles & Process-Related Criteria for SBMI. Source: Breuer et al. [10].

Guiding Principles	Process-Related Criteria
Sustainability Orientation with clearly communicated vision.	Reframing BM components and their relations into a sustainability perspective.
Extended Value Creation beyond only for the company, customers, and shareholders.	Context-Sensitive Modelling , that integrates externalities in traditional BM's.
Systemic Thinking , recognizing BMs as a boundary-spanning interactive system.	A Collaborative Modelling Process , that involves key stakeholders into the process.
Stakeholder Integration , while recognizing their needs, interdependence, and influence.	Managing Impacts and Outcomes - monetary and non-monetary impacts.

Breuer et al.'s [10] guiding principles and process-related criteria compile the most relevant theoretical works in the field to set the minimum requirements for SBMs and criteria to support their development. Their work re-iterates the importance of considering the expanded context in which businesses are embedded and the integration of a wider net of stakeholders in the process of SBMI.

2.3 Recent Collaborative, Inter- & Transdisciplinary Approaches for Business Model Innovation with Students and Organizations

Collaboration between higher education institutions (HEIs) and industry is increasingly seen as a vehicle to enhance innovation. HEIs are encouraged to build partnerships and multidisciplinary innovation projects based on real-world problems to benefit both student learning and businesses' innovation capability [16]. Beyond this, attention has been given to an emerging mission for HEIs, one of co-creation for sustainability between HEIs, industry, and civil society [45]. In teaching, the concept of students engaging with organizations in action-learning projects, which allows them to work on real-world and increasingly sustainability-related challenges, is not new, and variations of these can be found in many MBA and other programs across the world. Further learning methods, such as inter-/transdisciplinary, collaborative, and problem-based learning, have received increasing attention in higher education and are believed to be fruitful for developing competences for sustainable development and entrepreneurship [18]. Table 3 provides an overview of how these methods are defined.

Given that SBM's are seen as boundary-spanning, interactive systems incorporating pro-active multi-stakeholder management [7,10] make transdisciplinary and collaborative approaches of particular interest. Furthermore, digital transformation and sustainability constitute a "wicked" problem for many organizations [46] that require different ways of understanding and (re-)solving the issues involved. Thus, calling for perspectives from different disciplines and diverse stakeholders' interests in the development process, allowing for rich combinations of otherwise disconnected pools of ideas and solutions to complex problems. Diversity seems to contribute not only to creativity phases and development but also to implementation [16].

Table 3. Teaching and Learning Methods for Sustainability Education (based on [47-48]).

Method	Definition
Action Learning	Active participation in the problematization process through research and problem solving.
Interdisciplinary Learning	Incorporating different disciplines and the expertise of multiple methods to solve a particular problem.
Transdisciplinary Learning	Aims to go beyond the concept of the academic discipline, including stakeholders like organizations, customers, and citizens.
Collaborative Learning	Refers to methods, activities, and environments where two or more learners engage in a common task.
Problem-Based Learning	A transdisciplinary, systemic approach to problems where learning is organized around societal, environmental, and economic issues both globally and locally, potentially enabling complex decision-making processes.

The call for diverse (external) stakeholder inclusion emphasizes the need to strengthen communication and participatory leadership skills to engage with diverse groups of people. The importance of collaborative and participatory leadership approaches and practices has already been emphasized for both SBMI and digital transformation processes [46,49,50]. One approach that specifically applies to this is *The Art of Hosting*, which may be seen as both inter- and transdisciplinary as it draws on different techniques and emphasizes the inclusion of diverse groups of stakeholders [51,52]. The approach offers a "space" and practice area for building participatory leadership through conversation and focuses on moving from strategic conversations to wise action and systemic change. It can be offered as a complimentary training program in which participants learn to facilitate and host conversations, challenge their thinking, stretch their imagination, cultivate creativity, and co-create interventions.

Interdisciplinary approaches are of further importance in this context as it allows for the integration of disciplines that can complement the more dynamic and systemic processes of SBMI. In this line, integrating more "designerly" approaches and creative thinking tools has increased and are said to enhance the learning experience and process [53]. One, in particular, *Design Thinking* (DT), has gained increasing popularity in the business environment [54]. DT is an approach and collection of techniques from different disciplines, which should lead to solving complex problems and developing new user-centered ideas. Design thinking includes context analysis, problem identification and framing, idea and solution generation, creative thinking, sketching and drawing, modelling and prototyping, testing, and evaluation [55]. DT provides a compelling process for idea development [56], and more research into its use to stimulate SBMI has been encouraged [54].

The increasing interest in innovation and BMI has led to several learning collaborations between HEI and organizations. These have taken the shape of curricular and extracurricular activities that include semester courses, innovation labs, summer

schools, hackathons, or workshops that bring students together to work on challenges that start-ups, SMEs, or bigger organizations face.

However, research focusing specifically on SBMI with students and organizations remains scarce [12]. SBMI strongly calls for inter- and transdisciplinary approaches that are biased towards action and learning by doing, and although a rich body of literature under the umbrella of *Higher Education for Sustainable Development* (HESD) contribute by delineating competences for sustainable development [17] and teaching and learning methods [42]. What appears insufficiently addressed is research on the practical implementation thereof for SBMI. Furthermore, approaches in practice remain fragmented and educational silos can hinder the effective collaboration needed to enable learning in a landscape of practice. Overall, despite the rapid increase in research on SBMI [6,7,11], the educational facet in building SBMI capabilities of students and supporting organization's transitions to SBMs remains under-researched [12]. Thus, emphasizing a need for more research in this area, which our action-oriented project seeks to address.

3 Exploring & Designing an Inter- & Transdisciplinary Student Think Tank for Sustainable Business Model Innovation with Organizations

3.1 Project Description and Objectives

Currently, little is known on effective educational initiatives that connect students and organizations for SBMI. Our action-oriented research project aims to gain a deeper understanding of what an appropriate educational initiative should look like to enable collaborative, inter- and transdisciplinary SBMI with students and organizations. Spread over five phases, we investigate the formats, content, processes, and success factors of existing initiatives. The information obtained will then flow into developing a pilot project, which will be launched to experiment and unpack further insights.

The project aims to develop a think tank for SBMI that will focus on connecting students from different universities and faculties with organizations in the Upper Rhein region. The think tank will provide students with a unique opportunity to explore the connection between business models, society, and the environment. Furthermore, take on real-world challenges that organizations face and co-create innovative solutions in cross-border, interdisciplinary student teams. Organizations will benefit from extended know-how, resources, and tools to identify and drive ideas and build their innovation capability. In turn, the project will provide insights into existing approaches of HEIs and how to strengthen students' and SMEs' sustainable business model innovation capability in the Upper Rhein region.

Thus, the potential value of this research is twofold. On the one hand, the results will offer practical insights and recommendations for providing education for collaborative, inter-and transdisciplinary SBMI with students and organizations, benefiting both educators and organizations. Furthermore, contribute to the literature streams of SBMI and HESD. In the long term, we hope to enhance both student's and organizations' abilities

in the region to navigate towards more sustainable practices, including ethical and responsible use of digital technologies.

3.2 Research Design

The research project is both exploratory and action-oriented. It follows a design-based research approach defined by Wang and Hannafin [57, p.6] as “*a systemic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories*”. In line with our goals, the approach is seen as suitable for advancing both theory and practice [58]. As illustrated in Figure 1, our project is structured over five phases and builds on McKenney & Reeves’s [58] core phases of educational design research. This includes 1) analysis and exploration, 2) design and construction, and 3) evaluation and reflection, to move towards implementation and the provision of both practical and theoretical insights.

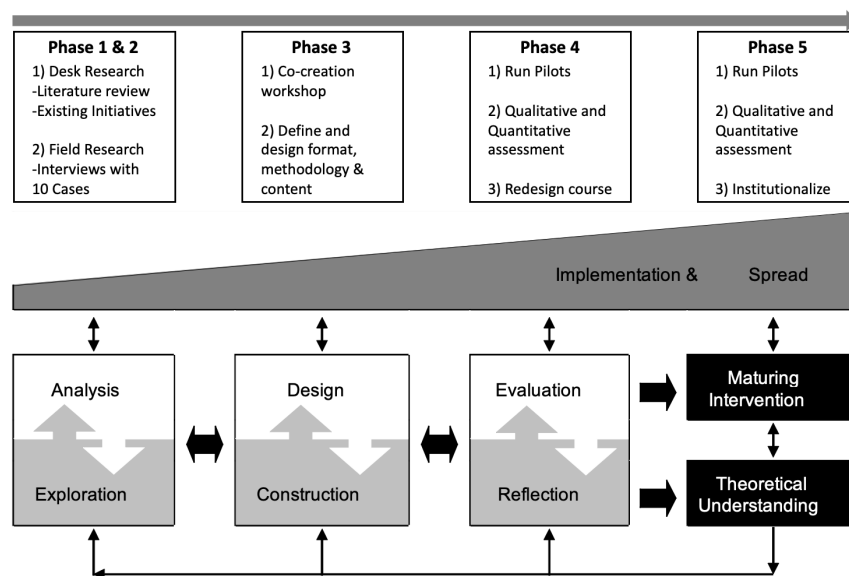


Fig. 1. Research Model. Adapted from McKenney & Reeves [58].

Phase 1 of the project consisted of desk research. Firstly, to review the extant literature on the topic to better define and delimit the key aspects relevant for the project. Secondly, to gain practical examples of similar initiatives focused on BMI or SBMI with students and organizations. The aim was to gain an overview of existing formats, approaches, methodologies, and tools in practice. Initiatives were selected based on their

focus on (sustainable) business model innovation and connecting students with organizations. Another focus was placed on collaborative, action-learning, and inter- and transdisciplinary approaches. The preliminary findings of this phase are presented in Section 3.3.

Phase 2 of the project is currently running and involves field research. From the initiatives identified in phase 1, ten cases situated in Europe and the USA are studied. Each case consists of a “good practice” example, which can be understood as cases that were selected based on how closely their offering related to collaborative, inter- and transdisciplinary SBMI with students and organizations and the level of innovativeness of their offering. The level of innovativeness can be understood as offerings that move beyond education in the classic sense towards innovative inter- and transdisciplinary approaches, formats, methods, and tools. Within each case, the person responsible for the initiative is interviewed. Furthermore, the aim is to engage additional interview partners to gather different perspectives (participating organizations and students). In-depth semi-structured interviews will be conducted, transcribed, coded, and analyzed using Atlas.ti software. This phase aims to provide deeper insights into the approaches, methods, and tools used and the success factor and outcomes of the initiatives.

Phase 3 will involve the co-creation and development of a set of approaches and tools for educational pilot projects for SBMI with students and organizations. This phase strongly builds on co-creation with various stakeholders including project partners, students, and lecturers from different faculties of participating educational institutions and a selection of business practitioners. The phase aims to define the overall approach and a variety of formats that can be experimented with as well as methodologies, and content.

Phase 4 involves the launch of pilot projects, which will include different HEIs and organizations in the Upper Rhine region. This phase will aim to experiment with and test the developed concept. The phase will include qualitative and quantitative data collection in the forms of interviews, observations, and surveys to aid in assessing and redesigning the offering.

Phase 5 will utilize the insights gained from the previous phases to evaluate and improve the concept. Furthermore, to assist in launching further pilots in varying forms for further development. The project aims to be institutionalized into formal structures as an ongoing experimentation platform and think tank for innovative inter- and transdisciplinary action-learning for SBMI.

The project is ongoing and currently in Phase 2. The following section provides insights into the learnings derived from Phase 1.

3.3 Preliminary Results

This section summarizes the preliminary results of phase one of this ongoing action-oriented research project [59]. Phase 1 included desk research to gain practical examples of similar initiatives focused on BMI or SBMI with students and organizations. The aim was to gain an overview of existing formats, approaches, methodologies, and tools in practice.

In total, 120 initiatives were identified that matched aspects of the criteria laid out in Section 3.2. The initiatives were then narrowed down to a selection of 59 initiatives that either met the criteria more closely or showed particularly promising approaches and methods or novel formats. These initiatives were then examined more closely to conclude their overall focus, their most common target groups, the types and duration of their offering, and their methods, approaches, and tools.

The overall findings from these 59 initiatives show that although many initiatives focus on innovation, sustainability, and business model optimization in a general sense, only a few (6) are focused explicitly on SBMI. Furthermore, when SBMI is included, it is often combined with other innovation and business improvement objectives. Most of the initiatives are targeted at master level students, although some are open to a mix of Bachelor and Master students, and five initiatives also included Ph.D. students. More than half of the initiatives were open to students from different faculties. Few initiatives focus on SMEs, while the majority focus either on large companies or a mix of organization types and industries. Only 6 initiatives focused specifically on start-ups were included in the selection as these were otherwise considered beyond the scope of our research. In line with the objectives of our project, most of the initiatives are university-based and connect students with organizations. Some other combinations were found, where students rather independently provide consultancy-like services to organizations or where universities provide services directly to organizations.

More than half of the offerings consist of semester courses, followed by mixed offers of workshops that last either a few days or up to 2 weeks. Some initiatives were found to offer independent courses that vary between 4 weeks and 10 months in length. All initiatives include some form of collaborative action or project-based learning methods in line with the selection criteria. Most of the initiatives are inter- and transdisciplinary in nature, and 23 initiatives also include design approaches and creative thinking tools. Many of the initiatives do not specify the tools utilized. Thus, it was only possible to identify 9 initiatives that explicitly mention the use of SBMI tools. The majority appear to work with classic BMI tools, such as the Business Model Canvas and other creative thinking tools. About 13 of the initiatives were specifically design-oriented and used only design-related tools.

The initial findings of this research appear to confirm a lack of initiatives (beyond those focused on start-ups) that focus on collaborative SBMI with students and organizations [12]. Promisingly, however, there appears to be an overall trend towards inter- and transdisciplinary approaches that bring students from different faculties together with organizations and utilize a mixture of methods and tools from various disciplines. In particular, the inclusion of design approaches and creative thinking tools by almost a third of the initiatives appears to reflect its increase in popularity in the literature [53,54]. The low use of SBMI tools would support the literature on finding that many existing tools remain unused [44]. However, since many initiatives do not specify the tools they use, this remains inconclusive. The next phase of our project work will more intensively research a selection of cases to gain deeper insights into the approaches, methods, and tools used and the success factors and outcomes of the initiatives.

4 Conclusion

Sustainability and digital transformation are but two developments that will challenge organizations to rethink their business models in a Society 5.0. In this line, the importance of sustainable business model innovation (SBMI) has increased and should enable organizations to operate within planetary boundaries while ensuring their long-term success. Successful SBMI requires diverse stakeholder engagement, integrating multiple disciplines, and quality local institutions and ecosystems. Thus, emphasizing the importance of collaborative, inter- and transdisciplinary innovation approaches. However, this may pose a considerable challenge for organizations and future leaders, requiring changes in their current practices and ways of thinking. Higher education institutions can play a major role in helping organizations meet the challenges of SBMI. Yet, research focusing specifically on SBMI with students and organizations and its practical implementation remain scarce.

This paper confirms and addresses the need for more research on appropriate educational initiatives for collaborative, inter-and transdisciplinary SBMI with students and organizations. The initial findings from the first phase of this ongoing action-oriented research project show that although many educational initiatives are applying collaborative inter-and transdisciplinary approaches that, as in the literature, only a few explicitly focus on SBMI with students and organizations. The findings also support the increased popularity of design approaches and creative thinking tools and emphasize the use of systems thinking and stakeholder discovery to understand the broader context better. However, several questions remain regarding how these approaches and tools are implemented and how they can be combined with SBMI tools. The remainder of this ongoing research project will continue to address these questions, among others, to contribute both practical and theoretical insights.

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The Adoption of Generalized Audit Software (GAS) and Digital Analytics by Shariah Auditors in Islamic Banks

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Abstract This paper identifies the adoption of information systems (IS) in the form of generalized audit software (GAS) and digital analytics by Shariah auditors (SAR) in Islamic banks (IBs). To explore further, this paper identifies this practice among four types of banking groups, namely full-fledged Islamic banks (FFIB), Islamic banking subsidiaries (IBS), development financial institutions (DFI), and Islamic windows (IW). In attaining its objective, this study employs a qualitative method by utilizing semi-structured interviews with six (6) key individuals in Malaysian IBs. Our findings support the notion that most SARs adopt and use GAS in their audit execution. Interestingly, few of them use digital analytics in conducting their audit assignments. This digital analytics application will undoubtedly help SAR seek the Shariah non-compliance (SNC) cases effectively. The samples selected by GAS would be much bigger compared to manual audit exercise, which depends on few selected samples only. However, there is an argument that the audit software application is not enough since SAR must pay visit physically to their auditee's premises. Finally, this study suggests that there should be some training for the SARs, especially regarding the GAS application, to detect the SNCs thoroughly in IFIs operations. Eventually, GAS can assist SAR in mitigating SNC cases while strengthening the public confidence and achieving *Maqasid As Shariah*.

Keywords: *Shariah auditor, GAS, digital analytics, IS Applications, Islamic banks.*

1 Introduction

In general, auditors use generalized audit software or (GAS) as tools to automate various audit activities. Accounting data auditing is likely to be computerized since most accounting transactions are also computerized. Despite the fact that GAS is the most common of the computer-assisted audit tools and techniques (CAATs), studies indicate that it is not universally used by internal auditors (Kent and Ahmi, 2013). Thus, this paper intends to explore the adoption of GAS by SAR in the IBs. Most other GAS studies have looked at regular internal and external auditors, but this paper focuses on SAR in IB.

According to Singleton (2006), more than 60% of all frauds are discovered due to a tip or by accident. Thus, using GAS to build a cornucopia of automated anti-fraud audit procedures that are run routinely against corporate databases is a space for more aggressive anti-fraud programs. Because of the design of computer-based accounting systems, auditors can use the audit client business's computer, or their own, as an audit tool to aid them in their audit procedures (ACCA, 2016). Accordingly, the extent to which an auditor may choose between using GAS and manual techniques on a specific audit engagement is determined by many factors. Those factors, among others, are the feasibility of conducting manual testing, the cost-effectiveness of using GAS, the availability of audit time, the availability of the audit client's computer facility, the level of audit experience and expertise in using a specific GAS, the level of GAS carried out by the audit client's internal audit function and the extent to which the external auditor can rely on this work.

In the Islamic banking environment, SAR assists in developing Islamic banks' (IBs) work (Khalid, Haron, & Masron, 2018). However, there is a relative lack of research on adopting the GAS among SAR in the IBs. Likewise, in IBs, there is a need for SAR to leverage on the GAS to support the internal control mechanism and monitoring system while strengthening the internal auditing functions. This situation will eventually support SAR in accomplishing the organization's objective (Abdul Wahab & Abdul Rahman, 2011). This issue definitely triggers the need of full adoption of GAS in IBs.

On the contrary, the lack of GAS adoption in IBs might create problems in audit execution. If IBs through its governance mechanism such as Shariah audit does not adopt GAS in their audit execution, they might fail to supervise the internal control and enhance the banks' lines of defense effectively. Thus, the likelihood of Shariah non-compliance (SNC) cases to happen is very high (Lahsasna, 2014).

Consequently, the SNC cases' presence may deteriorate the reputation of IBs and may weaken the confidence of customers, depositors, shareholders, and other stakeholders towards the banks (Dusuki, 2011; Shafii, Salleh, & Shahwan, 2010).

Considering the rapid growth of the banking industry and the strict consequences for the SNC as specified in the Islamic Financial Services Act (IFSA, 2013), it is indispensable for the IBs to have a proper 'check and balance' mechanism (Yaacob & Donglah, 2012). Undeniably, this mechanism is vital specifically for the SAR and for Islamic finance's sustainability in general. Thus, the investigation of GAS adoption by SAR in the IBs as undertaken in this study could significantly contribute to the literature.

The following section will review prior literature and a debate on the significance of GAS in the audit execution of SAR in the Islamic banking industry. Then, the paper describes a research methodology, and in the next section, the paper provides some analyses into the GAS adoption by SAR in the IBs. Finally, the conclusion is drawn by emphasizing the significant issues related to this study.

2 Literature Review

There is a wealth of literature concerning the adoption of accounting software either by the public sector or private sectors. However, the literature explaining the adoption and utilization of audit software is considered limited. However, some studies report the extent of the usage of GAS among external auditors. For instance, Kent and Ahmi (2013) found that audit firms in the United Kingdom use GAS at a shallow rate. Owing to the perceived restricted advantage of using GAS for auditing small clients, approximately 73% of external auditors do not use it. Although some respondents acknowledged the benefits of GAS, they were turned off by what they perceived to be high implementation costs, a lengthy learning curve, an adoption process, and a lack of ease of use. Thus, they preferred to use conventional manual auditing methods.

In another study, Van der Nest, Smidt, and Lubbe (2018) compare the current practices of internal audit functions regarding the use of GAS in the locally controlled South African banking industry to a benchmark developed from recognized data analytic maturity models. Findings from the study reveal that despite the accelerating adoption of information technology (IT) and the generation of big data within organizations, the use of GAS by internal audit functions is still at a relatively low level of maturity. Given that the world, particularly from a business perspective, is now fully immersed in a technological-driven economic outlook. This article's empirical results also confirm that the maturity of GAS use by internal auditors employed by locally controlled South African banks is still lower than predicted.

On the same ground, Smidt, Steenkamp, Ahmi, Van der Nest, and Lubbe (2021) examine the use of GAS as a data analytics tool by internal audit functions in Australia. From a total research population of 322 chief audit executives (CAE) of internal audit functions of organizations registered members of the IIA-Australia, 50 online questionnaires were returned. The study's findings can be used as a benchmark to determine if CAEs are up to date on current best practices in the field of technology-based tools and techniques for control tests.

Adamyk, Adamyk, and Khorunzhak (2018) investigate the auditing order and methodology for computer accounting software (CAS). The findings from the study reveal that software auditing should be conducted separately for each of its elements. The database management system (DBMS) and the application software enabling accountancy automation are the CAS software's functional portions. Techniques like general evaluation and subject check of the embedded algorithms of information processing are used for auditing as the first component section. However, if the enterprise accounting strategy changes, this would prevent mistakes.

In a recent study by Bradford, Henderson, Baxter, and Navarro (2020), they examine auditors' perceptions of the relationship between audit benefits and GAS use. The partial least squares approach analyzes survey data from 188 existing GAS consumers who are financial and IT auditors. The study's findings uncover that the only significant predictor of GAS's information quality for financial auditors in detecting material misstatements antecedent. Meanwhile, detecting monitoring deficiencies and fraud has a considerable effect on information quality for IT auditors. Information quality affects both financial and non-financial auditors' use. Only IT auditors are affected by system quality, and neither form of the auditor is affected by GAS use. The use of GAS by financial auditors is affected by service quality, but not by IT auditors. Service quality has no impact on GAS satisfaction for either party, and GAS usage and satisfaction increase audit benefits expectations.

However, as far as the researcher is concerned, the study concerning the adoption of GAS among the SAR in the IBs is limited due to the nature of the study's field. However, the issue is vital because

SAR plays its roles and responsibilities as the third line of defense that ultimately requires the effective tools, techniques, and mechanisms to identify the misstatement, fraud, errors, and SNC in the IBs.

3 Methodology

3.1 The Process of Developing the Research Instrument

This main objective of this paper is to ascertain the adoption of GAS by SAR in Islamic banks based on practitioners' views and experiences. However, before data could be collected, the study has developed the research instrument based on few stages as presented in the Figure 1 below:

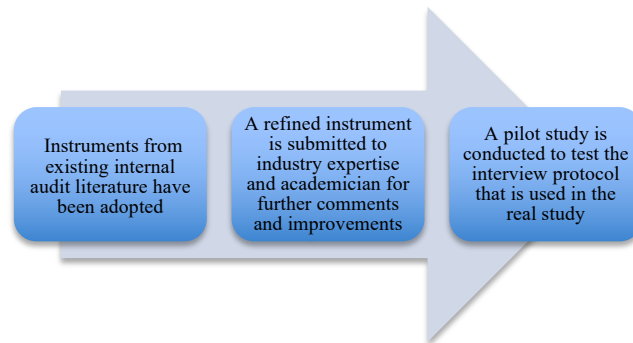


Fig. 1. The Process of Developing the Research Instrument

As illustrated in Figure 1 above, in the first stage of the process, a few instruments from the internal audit literature have been adapted and fulfilled this study's objectives. Second, the developed interview questions have been submitted to expertise scholar and industry's practitioner in the Shariah audit area as a subject matter expert. Finally, to validate the final set of interview protocol, the researcher conducts a pilot study with one of the Head of Shariah audit in IB. This pilot study is conducted before pursuing a real study to test and construct the effectiveness of the research tool (Marican, 2005).

3.2 Data Collection Method and Group of Respondents

Six (6) semi-structured interviews have been conducted with interviewees from four (4) types of IBs, namely full-fledged Islamic banks (FFIB), Islamic banking subsidiaries (IBS), development financial institutions (DFI), and Islamic window (IW). FFIB refers to either local or international banks that only offer Islamic banking products or services. Their operation is ruled by the Islamic Financial Services Act (IFSA 2013). Besides, IBS is a conventional bank with Islamic banking subsidiaries whereby they are governed by IFSA 2013 and the Financial Services Act 2013 (FSA 2013). Meanwhile, DFIs refer to specialized financial institutions established by Malaysia's government to establish and stimulate important sectors to achieve the objectives of the country's socioeconomics by offering Islamic products and services. Lastly, IW is a commercial bank given Bank Negara Malaysia's license to provide Islamic banking products and services. Like IBS, IW's operation is also administrated by the IFSA 2013 and FSA 2013 in their business operation (Bank Negara Malaysia, 2015).

3.3 Sampling Procedures

The selection of interviewee is based on purposive sampling. Even though respondents' sample size is relatively small, it is considered normal in a qualitative study because they are selected based on the criteria to provide valuable information on the phenomenon under investigation. (Creswell & Poth, 2018). The Shariah auditors' and Head of Shariah auditors' mix provides fruitful details about GAS use in Shariah audit practice (Mohd Ali, Mohamed, Shahimi, & Shafii, 2015). On top of that, perceptions from other relevant interviewees other than SAR, such as from Chief Shariah officer, are also pertinent to produce a robust and unbiased result.

3.4 Establishing Reliability and Validity

In developing the attributes of reliability and validity while at the same time minimizing risky in committing mistakes in this study, the researcher has employed few strategies as proposed by Creswell (2014) and Lietz, Langer, & Furman, (2006). These strategies are field notes, respondents' confirmation, and pilot interviews.

According to Bogdan and Biklen (2007), the high level of reliability in qualitative studies can also be accomplished by having rigorous data accumulation or systematic collection in the field. Effort and initiative that involves fieldwork such as appointments, official interviews, unofficial interviews, observations, and accumulation of documents will also enhance the reliability. For the purpose of this study, the researcher uses a small notebook to write down all activities that occur in the field. This note is transferred into the computer and saved accordingly for reference.

In addition, verification from respondents regarding the interview's data or sometimes known as member's checking, is a transferring procedure of validity from the researcher to the respondents (Mulhall, 2003). However, the current study does not receive verification satisfactorily due to low responses or inadequate feedback from the interviewees. Ironically, only two out of nine interviewees have verified the interview text and provide some suggestions for improvement. Most probably, all of them are busy with their working tasks, and they feel that they have contributed already by spending much time with the researcher during the previous interview sessions.

Finally, a pilot study is essential to emphasize the research instrument's development, the feasibility of the actual research, the suitability of the research design, sampling technique, data analysis technique, and the research questions' suitability (Neuman, 2014; Gay, Mills, & Airasian, 2012). This method, in turn, will increase the reliability of the data. The purpose of this pilot study is also to identify the plausible problems that might be faced by the researcher during the actual interviews soon.

3.5 Data Analysis and the Application of CAQDAS

Before the analysis can be performed, the verbatim transcription was accomplished for all interview sessions by employing the Computer Assisted Qualitative Design Analysis Software (CAQDAS), namely Atlas.ti version 8.0. This software is used to facilitate the process of transcribing the interview and data coding. To keep the data's confidentiality, the respondents were coded based on group and position types. For instance, HSA-FFIB will be referring to the Head of Shariah Audit from full-fledged Islamic Bank, without explicitly mentioning the institution's name. Finally, the study comes out with the list of the interviewees as presented in Table 1 below:

Table 1. Interviewee for the Study

Types of Group	Position	Respondent Code
Full-fledged Islamic Banks (FFIB)	Chief Shariah Officer	CSO-FFIB
	Head of Shariah Audit	HSA-FFIB
Islamic Banking Subsidiaries (IBS)	Head of Islamic Banking Audit	HIBA-IBS
	Senior Director of Islamic Business Unit	SDIBU-IBS
Development Financial Institutions (DFI)	Head of Shariah Audit	HSA-DFI
Islamic Windows (IW)	Head of Shariah Audit	HSA-IW

4 Findings and Discussions

4.1 The adoption of GAS by SAR

The series of interviews have provided fruitful information on the adoption of GAS by the SAR in the IBs. Some interviewees argued that the Shariah audit is technology savvy because they claim that SAR employs the latest software or IS while executing the auditing tasks. One of the interviewees from IBSs claims that:

"..., For Shariah audit, we do have IIA guideline. Based on this IIA, they encourage us to use T-mate and ACL. We use that as part of our technology to do sampling and to find exceptions on Shariah..." (HIBA-IBS).

The above argument is also supported by the Head of Shariah audit from DFI. He disputes that the employment of technology and software will ease and expedite the ISA work and eventually will enhance the ISA effectiveness as he opines:

"...There must be an efficient system since this audit system is vital. The most commonly used by the internal auditors is ACL Solution (Audit Management and Analytics). By employing this software, it is easy for us to get a sample. We can check what we want since its features help a lot. Our work will also be fast, effective, and efficient..." (HSA-DFI).

On the same ground, another interviewee supports this view by contending that the GAS assists them in finding the proper sample-based needs of users as she remarks:

"...There should be a proper system because the system is essential. The most common use in the audit field is ACL Solution (Audit Management and Analytics). Because it is easy for us to get a sample based on its features, we can check what we want...(HSA-FFIB).

Similarly, HSA-IW expresses his satisfaction with the adoption of GAS because of its functions in assisting the SAR's work. He disputes that:

"...GAS helps auditors a lot. Even audit work would be smoothly executed. Our work is effective and efficient..." (HSA-IW).

However, the above findings are contradict with the study conducted by Debreceny, Lee, Neo, and Shuling (2015), whereby they found that internal auditors in their study perceive GAS primarily as a tool for special investigations rather than as a foundation for their regular audit work. The most plausible reason behind this argument is that the development and application of GAS is significantly increase across the banking sector and it has been widely used by financial institutions including IBs.

In a nutshell, the adoption of GAS in the Shariah audit procedure and execution helps SAR in obtaining the needed audit sample as they expected. The adoption of GAS significantly ease and expedite the ISA work and ultimately will enhance the ISA's effectiveness.

4.2 The Application of Digital Analytics

Another exciting issue discussed by the interviewee relates to the significance of digital analytics in the Shariah audit procedure. SDIBU-IBS highlighting the implementation of digital analytics has an impact most on their working papers, and audit works have been changed from manual-based to automated-based as she mentions:

"...Previously, all our working papers are manual-based. Now, approximately 70% of our jobs are all automated. However, we still have to use human judgment when it comes to assessing control..." (SDIBU-IBS).

In line with the above argument, De Santis & D'Onza (2021) contend that big data and data analytics (BDA) is used to complement traditional audit procedures. In fact, HSA-FFIB supports this notion by arguing that after the application of the digital analytics, the audit judgment is more accurate since the SAR could increase the sample volume as she remarks:

"...Frankly, digital analytics solves many things. We try to explore as much as possible where we can AI (artificial intelligence) everything. The cover is much more in-depth because previously, the sample that we took maybe like 25 or up to 30 samples, but now the sample that we took is more than that..." (HSA-FFIB).

On a similar vein, HSA-IW contends that there is no sample in the digital analytics case because all of the data are considered as their samples as he asserts:

"...Sometimes, we run half a million of data. Now, there is no sample; instead, all of them are our samples..." (HSA-IW).

Interestingly, through digital analytics, the SAR can detect fraud and mismanagement much better as compared to manual audit exercise as he signifies:

"...Using digital analytics, we manage to discover very wrongly allocated funds, participants raise funds, and participant investment funds involving half of a million. Of course, we get the data through data analytics. So, we cannot depend on the manual. If we go by manual checking, we will not get much. Thus, we appreciate technology (digital analytics) very much to assist us in our audit work..." (HIBA-IBS).

However, a finding from Eilifsen, Kinserdal, Messier, & McKee (2019) shows that ADA (Audit Data Analytics) is relatively minimal, and it is uncommon for organizations to use more 'complex' ADA. More ADA is used for clients with integrated ERP / IT systems and newly issued audit assignments.

On the contrary, CSO-FFIB argues that even though software application for audit is paramount, the SAR still needs to visit and examine the locality of the auditees themselves as he affirms:

“...I am not very picky on this software element as auditing still requires a physical visit. Maybe this software is more important to finance for a consolidated report or risk management so that the process of escalation of risk is happening faster and based on real-time...” (CSO-FFIB).

A similar view has been highlighted by SC-DFI whereby she asserts that the management should consider the cost-benefit analysis in implementing the audit system so that the benefits received should outweigh the cost incurred as she contemplates:

“...For this audit, more importantly, we try to implement the best practices. If the software is just used to assist in producing the report, it is not critical; that is my personal view. Thus, not everything should be automated, and even if automation will increase the cost than the benefit received, it is not worth...” (SC-DFI).

HSA-DFI has stressed a similar tone. He argues that the implementation and adoption of GAS and data analytics depend on the management's support. If SAR wants to employ this system, the management has to leverage the system and allocate the budget adequately to install and maintain it in the long run.

In a nutshell, the findings discovered that most of the interviewees acknowledge the benefits of adopting GAS and digital analytics. Even though there are few opinions against this adoption, their benefits outweigh its deficiencies. However, the IBs need to provide proper training for their staff. Hence, as Ayedh, Mahyudin, Abdul Samat, & Muhamad Isa (2019) suggest, IBs should provide their team with essential IT and IS knowledge, including responsibility for Shariah's functions (i.e., Shariah audit, Shariah review, and Shariah risk management). Management should also suggest regular training for IFI staff, covering the information system and Shariah compliance problems.

5 Conclusion

This paper attempts to identify the adoption of GAS by SAR in IBs. Our findings support the notion that most SARs adopt and use GAS in their audit execution. Interestingly, few of them use digital analytics in conducting their audit assignments. This digital analytics application will undoubtedly help SAR seek the Shariah non-compliance (SNC) cases effectively. The samples selected by GAS would be much bigger compared to manual audit exercise, which depends on few selected samples only. However, there is an argument that the audit software application is not enough since SAR must pay visit physically to their auditee's premises. Finally, this study suggests that there should be some training for the SARs, especially regarding the GAS application, to detect the SNCs thoroughly in IFIs operations. Eventually, GAS can assist SAR in mitigating SNC cases while strengthening the public confidence and achieving *Maqasid As Shariah*.

The results offered in this study have specific implications for other Islamic jurisdictions around the globe that have a similar setting as Malaysia. Thus, this study provides a significant contribution to issues of the adoption of GAS in IBs. Besides, even though there are limited respondents through interviews, this study explores and elaborates on the respective matters. It also apprehends thoughts and intentions that are difficult to be observed using other methods (Creswell & Poth, 2018).

Like other empirical research, this study also has its limitations. First, not all the essential vital persons in Islamic banks were eager to share their valuable experience with us due to time constraints. Second, interviewees consist of only six (6) members, namely Shariah auditors, Heads of Shariah audit, Shariah Committee member, and Chief Shariah officer. The small interviewees' size can disputably limit the depth of discussions on the relevant issues. Future research could be conducted to capture more data from other experts like regulators and external auditors.

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