LogDynamics
International Conference

6th International Conference on Dynamics in Logistics

Bremen, Germany
February 20-22, 2018

Organized by:
Bremen Research Cluster for
Dynamics in Logistics (Log*Dynamics*)
www.Log*Dynamics*.com

Universität Bremen*

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Dear Participant,

For more than a decade, the International Conferences on Dynamics in Logistics (LDIC) brings together researchers and practitioners from logistics, operations research, production, industrial and electrical engineering as well as from computer science. LDIC 2018 is the sixth event in this series to be held in Bremen (Germany) from February 20th to 22th, 2018. This time, LDIC 2018 features satellite events such as the Interdisciplinary Research Colloquium of the International Graduate School for Dynamics and Logistics as well as tours through the Bremen Ambient Assistant Living Lab (BAALL) and the Robot Soccer Team (B-Human) at the Deutsches Forschungszentrum für Künstliche Intelligenz GmbH (DFKI). Similar to its five predecessors, the Bremen Research Cluster for Dynamics in Logistics (Log*Dynamics*) organizes this conference in cooperation with the Bremer Institut für Produktion und Logistik (BIBA), which is a scientific research institute affiliated to the University of Bremen.

The topic of the conference is the integration of dynamics within the modeling, planning and control of logistic processes and networks, which has shown to contribute massively to the improvement of the latter. Moreover, diversification of markets and demand has increased both the complexity and the dynamic changes of problems within the area of logistics. To cope with these challenges, it must become possible to identify, describe and analyze such process changes. Moreover, logistic processes and networks must be revised to be rapidly and flexibly adaptable to continuously changing conditions. LDIC 2018 provides a forum for discussion on advances in that matter.

The conference program consists of three invited keynote speeches and 57 papers selected by a severe double-blind reviewing process. The keynotes are presented as plenary sessions. Other presentations are organized in 19 parallel sessions. One special session highlights recent project results in the Log*Dynamics* Lab which is part of Log*Dynamics*. Participants are invited to freely choose between the sessions. The abstracts of the LDIC program can be found in this brochure. Moreover, preprints of the LDIC 2018 proceedings are electronically available on USB flash drives. Similar to the previous conferences, proceedings will be published by Springer.

At the end of this booklet, you can find some maps displaying the university area with the conference sites, the locations of the conference rooms and the destination of the conference dinner. We wish you a pleasant stay in Bremen and enjoy the conference.

Bremen, February 2018

Michael Freitag
Herbert Kotzab
Jürgen Pannek

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http://www.ldic-conference.org

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Bernd Scholz-Reiter

D1P: Introduction and Program by the Conference Chairs
Michael Freitag

D1K1: Keynote by Britta Philipsen (BIBA Auditorium)
Chair: Michael Freitag

Beside the Technical Concept – A Practical Approach on Automation Technology at Logistics Service Providers
Britta Philipsen

New technologies and automation concepts have had a major impact on logistic processes in the last years. Here, we will consider the practical side of these ideas with regards to three questions: Why should new technologies be used, which technologies offer profitable capabilities, and how may this be implemented efficiently? To this end, we discuss customer requirements and increase of output, but also consider aspects like employee acceptance and project management.

D1S1T1: Collaborative Planning and Control (BIBA Conference Room)
Chairs: Michael Freitag and Nicole Megow

Digitalization Elements for Collaborative Planning and Control in Supply Chains
Endric Hetterscheid, Ulrike Beißert

Due to the increasing digitalization and networking along supply chains (SCs), the topic of Industry 4.0 (I4.0) is particularly important for collaborative planning and control. Considering new paradigms and a higher use of technologies, existing processes in value-added networks will fundamentally change. The Digitalization Elements (DEs) presented in this paper describe the future changes of planning and control processes with focus on production and distribution. Based on DEs, a concept allowing to design I4.0-oriented collaborative planning and control processes in SCs will be developed in future work.

Measuring the Quality of B2B Logistic Services – An Industry-specific Instrument
Aleksander Lubarski, Katharina Schute

Modern service providers are confronted with increasing competitive pressures and highly individualized customer needs. Especially in the business-to-business (B2B) market, long-term competitiveness is only possible as long as the specific requirements for the service development and provision are met, resulting in maintaining existing customers and gaining new ones. However, measuring customer satisfaction in the B2B market appears to be not as intuitive, since personal preferences are complemented by company-specific criteria and the buying center consists of numerous decision makers. In this paper, we analyze existing methods for measuring service quality and test them for their applicability in the real-life context of the logistic domain using expert interviews. The contribution is a refined method, which uses the existing literature as a basis that is enhanced with practical input from industrial logistic service providers.

Utilizing Domain-Specific Information in Decision Support for Logistics Networks
Markus Rabe, Dominik Schmitt, Majsa Ammouriova

This paper introduces the implementation and utilization of domain-specific in-formation in a decision support system (DSS) for logistics distribution networks. This information is used to steer an evolutionary algorithm's search for promising configurations of the network. Results show that utilizing this information im-proves the performance of the DSS.

D1S1T2: Vehicle Routing (BIBA Auditorium)
Chair: Tobias Buer and Anna Förster

Enforcing Structural Robustness for Vehicle Routing Plans despite Stochastic Demands
Marcella Bernardo, Jürgen Pannek

In this paper we propose an approach to derive a structurally robust solution of the capacitated dynamic vehicle routing problem with stochastic demands. The approach designs an a priori plan that minimizes transportation costs while allowing to accommodate changes in the demands without losing structural properties such as number of vehicles or optimality. We compare the proposed approach with stochastic programming with recourse. Considering a benchmark dataset, computational results show that the robust approach outperforms stochastic programming with recourse.

Economic and Social Advances in Road Cargo Transportation with Big Data Use in Vehicle Routing
Matthias Klumpp

Big data applications in transportation and logistics are much discussed before the background of mainly economic improvement potential. For the area of road cargo transportation, this contribution is discussing the use of geospatial data in truck routing especially in the context of autonomous driving and social sustainability concepts. Fleet management and cruise control systems have been established during the last decade in road transportation. However, the stationary vehicle routing before the actual travelled tour is subject only to planning and optimization based on a quite low level of information. For example, geospatial data regarding topography as well as speed limitations and trajectory as well as street elevation and bend characteristics are currently not used but have significant impact on truck speed, fuel consumption and driver workload. Therefore, a conceptual outline as well as a quantitative test simulation for applying geospatial big data in ex ante vehicle routing is provided. This does encompass obvious advantages in economic (reduced transport cost), environmental (reduced transport emissions) as well as social dimensions (reduced driver workload and working time). Further inquiries shall address detailed question as to how geospatial big data could be integrated into the daily routine and processes of vehicle routing in road transportation.

Fleet Management for Pickup and Delivery Problems with Multiple Locations and Preferences
Johan Los, Matthijs T. J. Spaan, Rudy R. Negenborn

To provide more routing flexibility and improve service in delivery processes, we extend the Pickup and Delivery Problem with multiple time-location combinations for service. Furthermore, we introduce preference possibilities for each option, and aim for finding solutions that balance minimizing total travel costs and customer or operator dissatisfaction. We compare an Adaptive Large Neighborhood Search metaheuristic with solving the problem exactly. Simulation experiments indicate that a multiple location scenario is highly beneficial compared to the corresponding single location scenario and that the metaheuristic always finds the optimum if this could be computed by the exact solver.

D1S1T3: Supply Chain Resilience and Risk Management (IW3 Auditorium)
Chairs: Herbert Kopfer and Hans-Jörg Kreowski

Mathematical Modeling for Integrating Production-Routing-Inventory Perishable Goods: A Case Study of Blood Products in Iranian Hospitals
Ayad Hendalianpour

In this study, a robust mathematical model for the integrated problem of production, inventory, and routing of uncertain perishable goods is presented in a network including a producer and a group of retailers in which transfer among retailers is for controlling the uncertainty of customer demands. Since the mentioned problem is NP-Hard, an innovative solution algorithm is suggested for it that leads us to the best solution with the best

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change in the vehicle routes in every stage of search. Finally, the suggested algorithm is done on the available data in the literature and a real case study and the results show high efficiency of this algorithm regarding time and quality of answers.

Mapping Research on Logistics and Supply Chain Coordination, Cooperation and Collaboration
Herbert Kotzab, Inga-Lena Darkow, Ilja Bäumler, Christoph Georgi, Sandra Luttermann

There is more than 25 years of research done in the field of logistics and supply chain coordination, cooperation and collaboration. With the means of citation and co-citation analysis by using the software tools HistCite and VOSviewer we present a bibliometric mapping in order to characterise the intellectual foundation of this body of research. Our results show a dominance of logistics/supply chain coordination research with an emphasis on formal-analytical analysis of supply chain inventory management, contracting and pricing. Independently from this, there is an empirical, theory-driven stream on logistics/supply chain cooperation and collaboration.

Investment of the Belt and Road Initiative (BRI)
Jing Ye, Haasis Hans-Dietrich

Chinese President Xi Jinping unveiled the Belt and Road Initiative (BRI) in 2013, intends to promote traffic connectivity and regional economic cooperation by reviving the ancient Silk Road. Under this background, this paper aims to give an overview about the impacts of the BRI on international logistics network, through identifying crucial influencing factors and analyzing the relationships between the BRI and these factors. The analytical study shows the BRI influences international logistics network by both qualitative and quantitative factors in a comprehensive way. The BRI-induced challenges and opportunities also indicate the future research possibilities about international logistics network design/redesign.

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D1S2T1: Collaborative Planning and Control (BIBA Conference Room)
Chairs: Anna Förster and Tobias Buer

Collaborative Operational Planning for Decentralized Spare Parts Supply Chains
Matheus Cardoso Pires, Enzo Morosini Frazzon, Lucas de Souza Silva, Túlio Henrique Holtz, Philipp Saalmann, Bernd Hellingrath

Supply chains are usually challenged with situations of information divergence, once multiple agents with individual goals are involved. To cope with this challenge, thus improving supply chain efficiency, collaborative operational planning embodies a promising opportunity. In this paper, a structured procedure for implementing decentralized planning in spare parts supply chains integrated to intelligent maintenance systems was developed, tested through simulation and had its performance compared to a classical managing approach. The decentralized planning provides more efficiency even in scenarios with higher uncertainties.

Effects of Sensor-based quality Data in Automotive Supply Chains – A Simulation Study
Daniel Sommerfeld, Michael Teucke, Michael Freitag

Supply chain risk management (SCRM) is becoming increasingly attractive as it opens up various control opportunities in case of rising volatility in value-added networks. Sensor-based, real-time quality data will be the founding an event-driven organization of supply chains with regard to more transparency. The fol-lowing article presents the opportunities of using real-time, sensor-based quality data in automotive supply chain (SC) analyzed within a simulation study. There-fore, a discrete-event simulation of an automotive SC evaluates the usage of quality data. Different scenarios of control mechanisms are developed in three test cases characterized by different quality failure probabilities. For each of the test cases, the effect on stocks is described. The investigations show the positive effect of using real-time quality data to reduce stocks. The most positive effect is related to methods like special transports, but their cost-intensive structure has to be optimized. In conclusion, sensor-based quality data can face the rising volatili-ty. Further research should focus on innovative controlling methods.

Ranking Parameters of a Memetic Algorithm for a Flexible Integrated Logistics Network
Elham Behmanesh, Jürgen Pannek

Increasing level of competitiveness in real word cases, forces enterprises to collaborate in multiple dimensions like resource sharing, information sharing, capacity planning and delivery path flexibility. These efforts make the logistics network problem more complex and most of the time impossible to find an optimal solution in a traditional way with acceptable time. In this paper, we present an costumization approach for a memetic algorithm to an integrated forward/reverse supply chain model which is flexible in delivery path. To this end, Taguchi method is adapted to identify the most important parameters and rank the latter. The results are illustrated by a numerical case study.

Day 1, Session 2, Track 2

D1S2T2: Data Analytics (BIBA Auditorium)
Chair: Walter Lang and Rainer Malaka

Towards a Flexible Banana Supply Chain: Dynamic Reefer Remperature Management for Reduced Energy Consumption and Assured Product Quality
Xiao Lin

We propose a strategy for dynamic temperature management inside reefer containers in banana supply chains, with the objective of reducing energy consumption and deliver bananas with good quality. In this paper a model is developed to determine optimal temperature profiles for the future days during shipment. To assure the right quality in a dynamic environment, continuous monitoring inside reefers can be used to check the status of bananas. The optimization takes into consideration of disturbances of banana quality and estimated arrival time. Therefore, decisions are updated each day to cope with the possible disturbances. Simulation experiments compare the proposed approach and currently used approach. Results show that with the proposed approach, bananas can be delivered with right quality and reduced energy consumption.

Forecasting Manufacturing Tardiness in OEM Milk-Run Operations within the Industry 4.0 Framework
Antonio Novaes Galvão, Orlando Fontes Lima Jr., Giset Natalia Montoya Moreno

In a milk-run OEM pickup operation over an urban road network the manufac-turing of components by suppliers is subject to varying tardiness on order release dates. Tardiness control by the logistics operators, when delivering parts and com-ponents to the OEM production line, which is assumed to work according with the Industry 4.0 procedures, must also follow the new paradigm. In this context, IoT will be extensively used in smart sensors in association with a Big Data repository of productive information for production and logistics planning. The required in-tegration of manufacturing tardiness inference and logistics operations in the In-dustry 4.0 context is analysed in the paper.

Big Data Analytics: A Case Study of Public Opinion towards the Adoption of Driverless Cars
Rasmus Buch, Samaneh Beheshti-Kashi, Thomas Alexander Sick Nielsen, Aseem Kinra

With the growth of textual data and the simultaneous advancements in text analytics enabling the exploitation of this huge amount of unstructured data, companies are provided with the opportunity to tap into the previously hidden knowledge. However, how to use this valuable source, still is not unveiled for various domains, such as also for the transportation sector. Accordingly, this re-search aims at examining the potential of textual data in transportation. For this purpose, a case study was designed on public opinion towards the adoption of driverless cars. This case study was framed together with the Danish road directorate, which is, in this case, the problem owner. Traditionally, public opinion is often captured by means of surveys. However, this paper provides demonstrations in which public opinion towards the adoption of driverless cars is examined through the exploitation of newspaper articles and tweets using topic modelling, document classification and sentiment analysis. These analyses have for instance shown that text analytics may be a supplementary tool to surveys,

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since they may extract additional knowledge which may not be captured through the application of surveys. In this case, the Danish Road Directorate can use these result to supplement their strategies and expectations towards the adoption of driverless cars by incorporating the public's opinion more carefully.

D1S2T3: Supply Chain Resilience and Risk Management (IW3 Auditorium)
Chairs: Herbert Kotzab and Otthein Herzog

Theory Landscape and Research Perspectives in Current Supply Chain Resilience Research
Lukas Biedermann, Herbert Kotzab, Pettit Herbert, Tim Pettit

In an era of turbulence and increased volatility, the concept of Supply Chain Resilience is increasingly gaining attention within supply chain and logistics management research. However, both practitioners and scholars are still facing inconsistencies in the describing terminology, and thus anticipate a comprehensive understanding of the nature of Supply Chain Resilience. By conducting a systematic review of existing literature, and applying the conceptual lens of borrowing theories from related scientific disciplines, this research identifies 56 different theories and ten different perspectives within existing Supply Chain Resilience literature. This paper contributes to a better understanding of current Supply Chain Resilience research perspectives, based on theories applied within the field, and helps scholars to better investigate supply chain research activities within the proposed landscape of Supply Chain Resilience.

Modeling of Critical Products Supply Chain required to affected People on Earthquakes and Tsunamis Through the Use of SCOR Model
Raul Zuniga, Gabriel Icarte, John Griffiths, Juan Lopez, Juan Quezada

The aim of this paper is modeling the critical products' supply chain to supply suffering population by strong earthquakes and tsunamis. The supply chain of these products is described through the use of Supply Chain Operations Refer-ence (SCOR) model using a set of standard processes. The developed model al-lows minimization of companies' complexity in the chain and identifies which are the critical links, obtaining an integral vision of the chain. It is concluded that the proposed model will contribute the improvement of delivering critical products to affected people.

Model of Stochastic Optimization for Deteriorating Cargo Inventory Control at Port's Terminal
Ludmila Filina-Dawidowicz, Mykhaylo Postan

Perishable cargo service deals with the possibility of its deterioration during execution of particular links of transport and logistics chains, including cargo trans-shipment at ports. Therefore, it is reasonable to search for the ways to improve these goods inventory system aiming at deterioration rate decreasing during cargo storage. The paper presents the model of optimal inventory control for perishable product which has been transshipping through the port's terminal. Proposed approach takes into account the dependence of deterioration rate of cargo during its storage at terminal's warehouse on the additional investments intended for this rate decreasing. The corresponding stochastic optimization problem has been formulated and analyzed. The paper is illustrated by numerical example based on the real data, which validates the optimization problem.

D1S3T1: Multi Agents and System Dynamics (BIBA Conference Room)
Chairs: Klaus-Dieter Thoben and Otthein Herzog

Interval Superposition Arithmetic Inspired Communication for Distributed Model Predictive Control
Tobias Sprodowski, Yanlin Zha, Jürgen Pannek

In this paper, we combine an quantised communication approach for a distributed system consisting of holonomic robots with the set characterization to further reduce the communication load. To ensure collision avoidance

among the robots, the trajectory is quantised and incorporated into a distributed model predictive control scheme. Combining this quantised approach with the set characterization to communicate only the lower and upper bound, the communication load is independent of the necessary horizon length while numerical results still show that target states are reached.

Systems Dynamics Modeling of Dependent Requirements Variations in Automotive Supply Networks
Tim Gruchmann, Tobias Rebs

Addressing the root causes of schedule instability, particularly the unreliability of suppliers' production processes in a supply network, can help to curtail short-term demand variations and increase the overall supply chain efficiency. Hence, we introduce a stylized automotive supply chain with two suppliers and a single original equipment manufacturer (OEM). This supply chain can be disrupted by a shortage occurring at one of the suppliers due to random machine breakdowns, what consequently creates dependent requirements variations (DRV) affecting both the OEM and the other supplier. Using a System Dynamics (SD) simulation which contains the said mechanism causing schedule instability, comparative simulation scenarios were carried out to gain theoretical insights with regard to the nature of DRV. As a result, the simulation study shows that the Bullwhip Effect is not just detectable on a vertical supply chain level under demand uncertainties, but also on a horizontal supply chain level when production risks are present.

Building Fast Multi-Agent Systems using Hardware Design Languages for High-Throughput Systems
Jannis Stoppe, Christina Plump, Sebastian Huhn, Rolf Drechsler

While being from entirely different domains, Multi Agent Systems (MAS) and Hardware Design Languages (HDLs) rely on the same core concepts (parallelism, separation of concerns, communication between independent entities). This paper introduces the idea of utilizing the foundation of HDLs, with their focus on fast simulation and correct timing, to implement multi agent designs.

D1S3T2: Data Mining (BIBA Auditorium)
Chairs: Nicole Megow and Rainer Malaka

Applying Process Mining in Manufacturing and Logistic for Large Transaction Data
Wacharawan Intayoad, Till Becker

Process mining is a promising approach to extract actual business processes form event logs. However, process mining algorithms often result in unstructured and unclear process models. Moreover, sufficient data quality is required for accurate interpretation. Therefore, adopting process mining for the field of manufacturing and logistics should take into account the complexity and dynamics as well as the heterogeneous data sources and the quality of event data. Therefore, the objective of this work is to study the application of process mining in the manufacturing and logistics domain with real data from manufacturing companies. We propose a methodology to improve the limitations of process mining by using a Markov chain as a sequence clustering technique in the data preprocessing step and apply heuristic mining to extract the business process models. Finally, we provide results from an experiment with real-world data in which we successfully improve the quality of discovered process model in the regards of replay fitness dimension.

Big Textual Data in Transportation: An Exploration of Relevant Text Sources
Samaneh Beheshti-Kashi, Rasmus Buch, Maxime Lachaize, Aseem Kinra

Planning and decision-making in transportation and logistics projects involve a large number of stakeholders with distinct and often incompatible concerns and agendas, which all is accompanied by a high degree of uncertainty. In order to reduce this uncertainty, traditionally different sources of data are used. On the one hand quantitative data such as national statistics, or surveys are incorporated which are usually scarce and expensive.

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On the other hand qualitative data from public consultancy may be used which is not easy to gather and to be analysed quickly and systematically. With the emergence of Big Data and growth in Big Data techniques, a huge number of textual information is now utilizable, which may be applied by different stakeholders. Formerly unexplored textual data from internal information assets of organisations, as well as textual data from social media applications has been converting to utilizable and meaningful insights due to the advancements of text mining techniques. However, prior to this, the availability of textual sources relevant for logistics and transportation has to be examined. Accordingly, the identification of potential textual sources and their evaluation in terms of extraction barriers in the Danish context has been focussed in this paper.

Understanding Conflicts between Logistics Infrastructure Development and Local Supports: A Structural Equation Model of the case of Pakbara Deep Sea Port in Thailand
Pairach Piboonrungroj

Logistics development can generate both positive economic impact and concern over negative social impact in the area. Such conflict has been discussed widely but seldom in academia. To understand the underlying reason for such conflict, this study aims to develop and examine the logistics on resident supports in the deep-sea port project. We test the model with the case of Pak Bara Deep Sea port on the West Coast of Thailand according the ongoing attempt of the government for the project but lacks of supports from the local community. A research model was developed under the concept sustainable development and related studies on logistics impacts and social supports. The model wasempirically tested using the Structural Equation Model (SEM) technique to explain the endogenous latent variable (support for the Pak Bara deep-sea port) and logistics impact as one of the exogenous latent variables together with economics, environment, social and culture, technology, andtrust). Survey data were collected using self administrative questionnaires from 310 residents in Satun province, where the project located. The study found that perceived impacts on environment, logistics, and trust in government significantly affect the resident supports. The path analysis shows that logistics aspect affects the resident supports the most. Moreover, the path analysis of each item shows that satisfying in transportation affects the resident supports the most. Contrast to many believe, it was also found that logistics impacts is critical to local residents as well as social impacts, whilst economic and environmental impact are more concerned by outsiders.

D1S3T3: Future Visions and Applications (BIBA Conference Room)
Chairs: Michael Freitag and Michael Beetz

Retail Micrologistics: Chaotic Storage Taken to the Point of Sale
Thomas Jan Neukirchen

An overview of research questions and opportunities arising in the area of retail micrologistics is given. The latter is defined by assuming that w.r.t. a retail store environment, each item is tagged and individually traceable in real time, ordering principles and physical store layout are separated, and these principles are applied selectively to a shop floor, thus involving the consumer and primarily fast moving consumer goods (FMCG). Use cases are outlined.

Decommissioning of Offshore Wind Farms - A Simulation-Based Study of Economic Aspects
Thies Beinke, Abderrahim Ait Alla, Michael Freitag

After a useful life of 20 to 25 years of existing offshore wind farms, the decom-missioning will be a challenging task. In this context, an optimized planning of de-commissioning enables savings of energy costs. Due to the lack of sufficient em-pirical data about decommissioning of offshore wind farms, simulation tech-niques represent a suitable analysis tool to investigate such planning problems. The present contribution examines the effects of tactical decisions in the decom-mission phase of offshore wind farms by the use of a discrete-event, agent-based simulation study. The variation in the number of used vessels as tactical decision in connection with weather conditions is investigated. The results show that adapt-ing the number of vessels can reduce about 6 % of the decommissioning duration.

Requirements for an Augmented Reality-based Assistance System – Raising the Safety Level of Mobile Cranes
Moritz Quandt, Thies Beinke, Michael Freitag, Christian Kölsch

Commercial vehicles raise the efficiency of work processes in many fields of ap-plication. This is in contrast to a comparatively high number of accidents that are often associated with serious personal and property damage. Therefore, this con-tribution presents an approach to develop an assistance system for mobile cranes that raises the safety level in the working area. By applying Augmented Reality technology, the developed assistance system provides safety-related information directly in the field of vision of the crane operator. In this contribution, the au-thors present user requirements for the development of such an assistance system. On this basis, trajectories for the user-centered development for an Augmented Reality-based assistance system are revealed in the context of mobile cranes.

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D2K1: Keynote by Alan McKinnon (BIBA Auditorium)
Chair: Herbert Kotzab

The Global Logistics Skills Shortage: Its Extent, Causes and Possible Remedies
Alan McKinnon

This presentation will report the results of a study undertaken for the World Bank on the shortage of logistics skills around the world. In the course of the research approximately 250 logistics and HR professionals from over fifty countries were consulted. The survey found that there is a serious, widespread and worsening shortage of logistics skills at different occupational levels. In emerging markets the problem is most acute at the managerial level, while in developed countries it is often at the operative level where recruitment is most difficult, particularly in the road haulage sector. There is evidence that skill shortages are constraining the growth, productivity and quality of logistics services. The presentation will examine the reasons for these skill shortages and consider what can be done to address the problem. It will emphasise the importance of a multi-stakeholder approach, the need to tailor solutions to the circumstances of particular countries and the opportunities for transferring good practice internationally.

D2K2: Keynote by Irene Rosberg (BIBA Auditorium)
Chair: Herbert Kotzab

Modernizing the Human Element of the Shipping Industry: A Step in the Right Direction
Irene Rosberg

One of the main actors in sustaining the global society is shipping industry which covers many different segments. The industry is now realizing the over-due attention to modernizing its most important pillar: the human element.

D2S1T1: Supply Chain Management (IW3 Auditorium)
Chairs: Michael Freitag and Michael Beetz

Simulation vs Optimization Approaches to Ripple Effect Modelling in the Supply Chain
Dmitry Ivanov, Alexandre Dolgui, Marina Ivanova, Boris Sokolov

As a result of supply chain structural dynamics, the ripple effect occurs whereby disruption propagates downstream or upstream from the initial disturbance point in the network. Since ripple effect analysis includes both dynamic and static parametrical sets, the research objective of this study is to identify recommendations on the preferable applications of simulation and optimization methods. We identify some problem classes and datasets for which optimization, simulation, and hybrid optimization-simulation methods can be recommended.

Designing a Model for Supply Chain Agility Indexes Using Interpretive Structural Modeling (ISM)
Haniyeh Dastyar, Ali Mohammadi, Moslem Ali Mohamadlou

Competitive environments in today's world are characterized by rapid changes and unpredictable markets. The approach concerned with the interaction of the organization, the market, and an external perspective to flexibility, is known as the Supply Chain Agility(SCA). The main purpose of this paper is designing the model of agile supply chain in Fars Nov Cement Company. For achieving this objective and for extracting agility indexes, research literature has been first reviewed in detail, and then a part of identified indexes were subjected to final confirmation according to the opinions of experts and Fuzzy Screening Method. After this stage agility model of supply chain was designed for this company based on opinions of experts and using Structural Interpretive Modelling(ISM) method. The results of this research show that proper planning and network orientation indexes form the basis of agility in supply chain are acted as a foot-stone of model. These two indexes also have the highest importance among other indexes of model.

Fleet Expansion Strategy of Indonesian Container Line Integrated with Sea Tollway Logistic System
Satrio Wicaksono, Uswatun Hasanah, Rizqi Luthfiana Khairu Nisa, Jauhari Alafi

This paper presents the potential fleet expansion strategy to be deployed by one of Indonesian shipping liner for Indonesia domestic shipping market. Incorporating the new changes on sea tollway system, the study provided analysis to provide a subtle investment strategy for container shipping given market uncertainties that might happen in the future. The study performed economic growth analysis and translated them into freight growth potential. By incorporating diverse company market capitalization scenario, relevant expansion strategy is discovered. It is found that slot utilization and carrying capacity plays important role in assuring company's profitability. The proposed research also delivered potential new routes to be exploited by the container shipping line.

D2S1T2: Maritime Logistics (BIBA Auditorium)
Chair: Hans-Dietrich Haasis and Walter Lang

Integrating Ship Scheduling and Berth Allocation for Container Seaports with Channel Access
Christian Bierwirth, Paul Corry

In this talk we discuss the discrete berth allocation problem under channel access restrictions given by a river or sea gate through which calling vessels have to transit. We further outline an optimization concept for scheduling vessel movements in the channel related with the well known flowshop machine scheduling problem.

Revenue Management and Freight Rate Coordination in the Container Shipping Industry
Jörn Schönberger

Freight rates in the container shipping industry are quite volatile. They are published regularly based on certain indexes and make a daily rate bargaining impossible. Carriers as well as customers agree long term freight rates to achieve longer term planning security. However, customers have the market power to enforce a published rate if it is lower than the contracted rate. We report about an approach that supports the shipping company to determine contracted freight rates under the consideration of this ``unfair`` customer behavior using segmentation-based pricing methods from revenue management.

Dependency of Pharmaceutical Logistics in Sub-Sahara Africa from Seaport Performance
Liliane Streit-Juotsa, Hans-Dietrich Haasis, Dorit Schumann-Bölsche

The problems of congestion in the seaports of the Sub-Saharan region are phenomenon that are interrelated to delays in the delivery of goods. These are visible through long waiting times of ships and freight goods or long line ups of trucks in the port area. Causes can be missing process transparency or ra-ther a mismanagement of agencies or inadequate communication and cooper-ation between the actors. This does not only prolong the length of good mov-ing processes or increases the costs of goods, but has a big impact on the sup-ply chain as a whole. The consequences of congested seaports can have, es-pecially in countries with inadequately developed infrastructure, grave im-pact on the function of logistics and therefore on the quality of end products. Temperature sensitive goods like pharmaceutical products can serve as an example. More than 90% of pharmaceutical products used in the Sub-Saharan region arrive via sea route and are further transported towards the inland or neighbouring landlocked countries (Therrien 2014, Schumann and Streit-Juotsa 2014). Additionally, more than 80% of external trade of these regions' countries is channelled through the ports (Njinkeu et.al. 2008). Despite the extensive goods transactions in the ports, the freight's logistics to rural re-gions and the hinterland is subject to difficult conditions. As an example, the port of Douala is analysed. This paper aims to show the significance of the ports for the development of the region but also discusses the impact of con-gested ports for the logistics of pharmaceutical products. The lack of trans-parency in processes of sea ports will be considered just like the overall lo-gistical activities between sea port and hinterland.

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D2S2T1: Production Scheduling and Control (BIBA Conference Room)
Chairs: Till Becker and Herbert Kopfer

Towards an Adaptive Simulation-based Optimization Framework for the Production Scheduling of Digital Industries
Ricardo Pimentel, Pedro Santos, Apolo Danielli, Matheus Pires, Enzo Frazzon

The effective and efficient assignment of orders to productive resources on manufacturing systems is relevant for industrial competitiveness. Since this al-location is influenced by internal and external dynamic factors, in order to be re-sponsive, production systems must possess real-time data-drive integration. The attainment of this kind of integration entails relevant praxis and scientific challenges. In this context, this paper proposes an adaptive simulation-based optimization framework for productive resources scheduling which takes advantage of forthcoming data transparency derived from the application of digital factory concept. The proposed framework was applied in a test case based on a production line of a Brazilian automotive parts supplier. The outcomes substantiate the applicability of adaptive simulation-based optimization approaches for dealing with real-world scheduling problems. Furthermore, potential improvements on the management of dynamic production systems derived from the application of digital factory concept are also identified.

Operator-based Capacity Control of Job Shop Manufacturing Systems with RMTs
Ping Liu, Jürgen Pannek

Capacity adjustment by using reconfiguration machine tools (RMTs) is one approach to deal with customers rapidly changing demands. However, disturbances (e.g rushed orders and machine broke down) and delays (e.g transportation delay and reconfiguration delay) are great challenge for the manufacturers. In order to deal with these problems, we propose an operator-based robust right coprime factorization (RRCF) method to improve the capacity control process of job shop systems. We illustrate the applicability of this approach by simulation results of a four-workstation job shop system are given to support the efficiency of the proposed method.

Predictive Control of a Job Shop System with RMTs Using Equilibrium Terminal Constraints
Qiang Zhang, Jürgen Pannek

In manufacturing, capacity adjustment is one of the major effective measures to cope with demand fluctuations and machine break-down. We propose a model predictive control (MPC) scheme to utilize the new type of reconfigurable machine tools (RMTs) for adjusting capacities within a job shop system. Our aim is to maintain a desired work in process (WIP) level and show stability of closed loop scheme by imposing equilibrium terminal conditions.

Day 2, Session 2, Track 2

D2S2T2: Maritime Logistics (BIBA Auditorium)
Chairs: Hans-Dietrich Haasis and Till Becker

Dispatching Strategies of Drayage Trucks at Seaport Container Terminals with Truck Appointment System
Ann-Kathrin Lange, Fredrik Branding, Tilmann Schwenzow, Constantin Zlotos, Anna Kathrina Schwientek, Carlos Jahn

Implementing a truck appointment system at container terminals is a successful method to smooth peaks in truck arrivals and thereby reduce truck waiting times and congestion in the port area. Inspite of the extensive literature on its impact on container terminal productivity, other stakeholders in the port drayage network with a truck appointment system at container terminals have been studied only occasionally. This papers aims to analyze different strategies of time window selection for port drayage companies considering different company sizes and competitor's strategies.

Analysis of the Choice Behavior for Container Transport Services in the Maritime Hinterland
Ralf Elbert, Katrin Scharf

The handling of the growing container volume is facilitated by standardization and digitalization. This, in turn, makes container transport services offered by actors of the maritime transport chain hard to differentiate. Additionally, ports are faced with fierce competition and the connectivity to the hinterland becomes crucial for their competiveness. Hence, for ports it is necessary to understand the choice behavior of decision-makers in the maritime hinterland to remain competitive. Therefore, a discrete choice model is developed to investigate the preferences of shippers and forwarders for transport services in the maritime hinterland. Transport services are evaluated regarding transport costs, transit time, frequency and IT services by shippers and forwarders operating in South-West Germany. Unsurprisingly, the results reveal that costs, time and frequency are highly important for both decision-makers. However, IT services require a differentiated consideration. Shippers prefer tracking and tracing, whereas forwarders prefer no IT services and reject the introduction of an eMarketplace, which indicates the perceived threat to their business model.

Global Value Chains and Supply Chain Trade: How Organizations Create Sustainable Business Models
Lars Stemmler

To take a lead in the digital revolution, if not at least in order to follow it, organizations comprehensively review their business models. Falling transport costs and decreasing costs for information exchange have propelled the emergence of global value chains and with it supply chain trade. Whereas the former have enabled firms to move production of goods away from the places of consumption, the latter drive production being split up into individual tasks performed at different locations worldwide. Now, digitalization drives a third wave with considerable impact on the future commercial sustainability of business models in manufacturing, trade and, last but not least, logistics. This paper will use Baldwin's concept of the Two Unbundlings to explain globalization from a historical perspective and assess the implications of this development on the logistics industry, which benefited in past, but must now be on the lookout to meet the changing needs of their trading and manufacturing clients.

Day 2, Session 3, Track 1

D2S3T1: Cyber-Physical Systems (BIBA Conference Room)
Chairs: Michael Freitag and Jürgen Pannek

Enhancing the Cybersecurity of Port Community Systems
Nils Meyer-Larsen, Rainer Müller

Major disturbances of large ports will most probably lead to tremendous negative effects to maritime supply chains and the whole economy. Beside physical threats, ports are also vulnerable to cyber attacks due to their dependency on information and communications technology. Port Community Systems (PCSs) are information hubs for ports integrating information from various sources for global supply chains, connecting systems of terminal operators, carriers, freight forwarders and authorities. In that way, Port Community Systems must be regarded as critical infrastructures – successful cyber attacks can lead to massive problems in port operation, in extreme cases even to a standstill, and thus – depending on the duration – to bottlenecks in the supply of industries and population and to severe consequences for the whole economy. The recent case of the NotPetya attack on Maersk, causing some central systems to be down for several days worldwide, is estimated to have caused a loss of about US$ 200–300 Mio. This paper presents ongoing work within the research project PortSec, aiming at improved resilience of PCSs with respect to cyber attacks.

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A Tool for an Analysis of the Dynamic Behavior of Logistic Systems with the Instruments of Complex Networks
Thorben Funke, Till Becker

It is known that the whole is more than the sum of its parts. In production for each machine a lot of information is available due to today's integration of automatic data recording. In this context, one way of representing the whole is the modeling as a complex network. Yet, present complex network analysis tools can either not manage the amount of data of such systems or neglect their dynamic behavior. Therefore, we present a tool, which meets these requirements of the logistic field, and demonstrate its abilities for a real-world example.

Evaluation of the Performance of Heuristic Algorithms in an Intersection Scenario
Tobias Sprodowski, Adnan Shoaib Mayet, Jürgen Pannek

In this paper, we consider an intersection scenario with autonomous connected vehicles which are crossing the intersection without any central control or traffic lights. The intersection as the operation space is discretised into a set of equidistant cells. Therefore, to avoid collisions, the vehicles reserve cell indices which are communicated in each time instant. We evaluate analytical and heuristic path planning algorithms to measure the performance criteria in simulations with respect to system aspects, i.e. execution time and memory consumption, and solution quality.

D2S3T2: Maritime Logistics (BIBA Auditorium)
Chairs: Hans-Dietrich Haasis and Frank Kirchner

Improving Logistics Efficiency in Offshore Wind Farms Construction
Sylvain Chartron, Hans-Dietrich Haasis

The increasing construction of offshore wind farms and their expected improved profitability call for a better efficiency in offshore logistics. Based on some existing principles from optimizing production techniques, this paper proposes an ad hoc model to measure and improve efficiency for logistics during offshore wind farms construction.

How Blockchain Could Be Implemented for Exchanging Documentation in the Shipping Industry
Christopher Loklindt, Marc-Philip Moeller, Aseem Kinra

The purpose of this study is to investigate the conditions under which blockchain technology can be adopted and the design criteria that are needed for exchanging shipping documentation in containerised shipping. The paper addresses the absence of academic literature on blockchain technology in the field of supply chain management and maritime shipping by conducting semi-structured interviews with representatives from business, IT, and public institutions. This qualitative data is analysed through a theoretical framework comprising transaction cost economics, diffusion of innovation and design theory. We provide insights into how blockchain can be leveraged for exchanging documentation for maritime logistics. Based on the theoretical model and stakeholder analysis, a set of eight design principles are proposed for the successful implementation of blockchain. These are 1) Immutability, 2) Decentralisation, 3) Security, 4) Privacy, 5) Compatibility, 6) Scalability, 7) Inclusiveness and 8) Territoriality. Four potential approaches for the implementation phase that are likely to affect the anticipated approach towards implementation are discussed to assess the likelihood of adoption by industry stakeholders. The paper substantiates that blockchain has profound implications for both private stakeholders as well as regulatory bodies, who must acquaint themselves with the ramifications blockchain technology will have on business processes related to supply chain management. To alleviate the impact of current documentation exchange mechanisms on supply chain efficiency in the maritime industry, our research aims at presenting guidelines for leveraging blockchain technology as a solution for exchanging documentation in the shipping industry. This exploratory paper intends to address the lack of prior academic literature to lay a foundation of academic literature in the field.

Port Call Optimization by Estimating Ships' Time of Arrival
Carlos Jahn, Tina Scheidweiler

Ships' estimated arrival times command an optimized port call and thus the heartbeat of every sea port. Various factors influence the waiting times of vessels at anchorage. Occupied berths or tide dependencies are just some of the factors leading to long waiting times before entering the port. Terminal operators cannot allocate the berths effciently and the hinterland transport cannot plan ahead due to the often times incorrect information regarding vessels' time of arrival. To reduce these problems with regard to an optimized port call, a prediction model for the maritime traffc situation in the German North and Baltic Sea is developed to determine future ship positions and, in particular, arrival times. Within this paper, the accelerated research project as well as its benefits for port call optimization and the maritime logistic chain are presented.

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D3K1: Tour through LogDynamics Lab (BIBA Hall)
Chair: Marco Lewandowski

D3S1T1: New Business Models (BIBA Conference Room)
Chairs: Yilmaz Uygun and Jürgen Pannek

Integrating High-Performance Transport Modes into Synchromodal Transport Networks
Sarah Pfoser, Thomas Berger, Georg Hauger, Claudia Berkowitsch, Reinhold Schodl, Sandra Eitler, Karin Markvica, Bin Hu, Jürgen Zajicek, Matthias Prandtstetter

The European Union aims to introduce synchromodal transport networks to facilitate sustainable and efficient freight transport. One fundamental opportunity of synchromodality is a modal shift towards environmentally friendly transport modes. In this respect, the present paper examines if a modal shift towards high-performance transport modes is beneficial for the concept of synchromodality. We consider the Hyperloop technology as a prime example for high-performance transport modes as it is proposed that it will be faster than air transport and more energy efficient than train transport. The results suggest that integrating the Hyperloop into synchromodal networks involves mutual benefits for both, the Hyperloop and synchromodality.

Supplier Selection and Order Allocation with Intermodal Transportation Cost
Getachew Basa Bonsa, Till Becker, Abdelkader Kedir

In this paper, a mixed integer non-linear program (MINLP) is proposed for the single item supplier selection, economic lot-sizing, and order allocation problem considering inventory holding, ordering, transportation, and item cost under quantity discount. The proposed MINLP determines the optimal economic lot-size, the allocation of order quantities among suppliers, and the number of trucks. In the proposed MINLP model lead time, the capacity of the supplier and truck, and demand of the product are incorporated as constraints. In order to understand the effect of transportation cost in the selection of suppliers and allocation of order quantities, the model is solved twice with and without the transportation cost function. Finally, the MINLP is solved in AIMMS (Advanced Interactive Multidimensional Modeling System) using its outer approximation algorithm to select the best supplier, to determine the economic lot-size, the corresponding order quantities and number of trucks needed to meet the demand.

A System Dynamics Approach for Internationalization Networking Process
Sylvia Mercedes Novillo Villegas, Hans-Dietrich Haasis

This paper presents the analysis of the relationship among internationalization, logistics capabilities, and supply chain flexibility (SCF) from an integrative perspective in order to address this gap in the literature. From a system dynamics approach, it is inferred a reinforcing relationship between logistics capabilities, SCF, and internationalization regarding trust and commitment as enablers. It is also established that commitment has an opposite relationship with SCF.

D3S1T2: Maritime Logistics (BIBA Auditorium)
Chairs: Hans-Dietrich Haasis and Klaus-Dieter Thoben

Simulation-based Analysis of Dispatching Methods on Seaport Container Terminals
Anne Kathrina Schwientek, Ann-Kathrin Lange, Carlos Jahn

Effcient dispatching of vehicles and transport orders between the quayside and the yard of container terminals is an important challenge for terminal operators. Despite the large amount of literature in this feld, there is no systematic approach investigating the effects of terminal characteristics on the performance of different dispatching methods. This simulation study aims to close that research gap for the case of different dynamic dispatching methods.

Conducting Safety Inspections of Gantry Cranes Using Unmanned Aerial Vehicles
Michael Stein

Abstract Port facilities operate in a highly competitive environment and maintain several supply chains simultaneously. The performance and interaction of these supply chains are vital to the national logistics infrastructure as well as the hinter-land with its connected services. Both aspects – competitiveness and dependency – make it vital for ports to maintain a structured and detailed inspection and maintenance schedule. This paper analyses the innovative approach of using un-manned aerial vehicles for inspection works. It argues that such technology enables costs reductions and increased operative benefits via high definition image generation at the same time and providing a valuable support to maritime safety operations.

Security in Maritime Logistics – Learning by Gaming
Rainer Müller, Hans-Dietrich Haasis

In maritime supply chains several measures are in place in order to mitigate different security risks. Future managers for security in supply chains need to be trained to select appropriate measures on different security related risks. This paper describes one proven practical approach to train personnel on security risks, mitigation measures and mechanisms between these two interacting themes. In detail, the approach follows the game based learning (GBL) concept.

D3S2T1: Internet of Things and Services (BIBA Conference Room)
Chairs: Hans-Jörg Kreowski and Jürgen Pannek

Design of Emergency Response System for Disaster Management Using VANET
Abdul Kishwer Khaliq, Amir Qayyum, Omer Chughtai, Jürgen Pannek

Catastrophic natural disasters have the strong negative impact on the economy and mankind around the globe. As transportation and communication play an important role in such situations, we develop an emergency response system for disaster management with the focus on land transport vessels and mobile rescue team members. We present a prototype of an emergency response system using Global Positioning System (GPS) and Vehicular Ad hoc Networks (VANETs), which includes a server (control room), that is used to collect the information about the disaster area and is also used to provide the desired services according to the request.

Wireless Pick-by-Light: Usability of LPWAN for More Flexibility in Warehouse Logistics
Usman Asghar, Ann-Kathrin Rohde, Michael Lütjen, Jörn Lembke, Michael Freitag

Pick-by-light is used for fast localization of items at the picking process in warehouse logistics. In general, pick-by-light systems are on tracks, which have to be powered by wires and which are fix installed at the rack. This is very expensive, wherefore wireless pick-by-light systems have gained a lot of research interest due to their flexibility, portability and low installation costs. However, the existing wireless pick-by-light systems have limited range and cause high maintenance efforts, which makes them inapplicable for bigger warehouses. This paper presents a wireless pick-by-light system based on LoRaWAN, a leading LPWAN standard, which is fully scalable.

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The proposed system offers long range due to unique LoRa RF modulation technique. The pick-by-light modules are built on lowest power LoRaWAN class A end devices in order to extended battery life. Furthermore, the system also proposes RSSI based asset tracking inside warehouses within the same framework for smarter routing of the human picker. In order to verify the proposed system, a prototype is developed and evaluated. The evaluation shows the technical implementation and its results.

Internet of Things and the Risk Management Approach in the Pharmaceutical Supply Chain
Giset Natalia Montoya Moreno, José Benedito Silva Santos Júnior, Antonio Galvão Novaes, Orlando Fontes Lima Júnior

Technology is advancing rapidly, accelerating and creating strategic innovations and new challenges in traditional business models. The Internet of Things (IoT) brings an opportunity to increase productivity and efficiency on the supply chain processes of the pharmaceutical industry. In this context, a new business vision, based on innovation and supported by new technologies, requires a risk and resources management approaches, encompassing the strategic-tactical-operational planning processes within the companies. This work aims to highlight the potential use of IoT features, considering a risk management approach to the pharmaceutical supply chain (PSC), based on an exploratory research methodology.

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D3S2T2: Port Operations, Seaport Hinterland Transport (BIBA Auditorium)
Chairs: Klaus-Dieter Thoben and Frank Kirchner

A Concept for Predictability and Adaptability in Maritime Container Supply Chains
Aaron Heuermann, Heiko Duin, Christian Gorldt, Klaus-Dieter Thoben

Logistics is an essential industrial sector for the digital transformation. Particularly maritime container logistic processes, which include numerous regional and global distributed stakeholders and numerous interfaces for data exchange between these parties, will benefit from digitalization. Using real time data about container vessels, truck fleets and containers for process predictions and adaptions will enable more efficient maritime container supply chains. In this paper, a concept for prediction and adaption of suitable cut-off times in maritime container supply chain will be introduced. Dynamic cut-off times at ports instead of static promise several process improvements, e.g. throughput and storage times at container terminals will be reduced and the utilized capacity of completely booked container vessels will be increased. Furthermore, the impact of the adaptive times on selected process times will be estimated using a sample calculation.

Assessment of Cooperation and Competition Among Container Ports in The Northern Adriatic
Elen Twrdy, Milan Batista

In this article, we analysed container throughput in Northern Adriatic ports (NAPs) in period 1990-2015. Along with well-known market indices method, we also discussed a simple two-state Markov chain model for qualitative forecasting of containers throughput evaluation, and the Lotka-Volterra dynamical model to identify possible competition/cooperation relationships between NAPs. In the end is given a comparison of throughput dynamics of NAPs and ports in Le Havre – Hamburg region.

A Collaborative Framework for Governance Mechanism and Sustainability Performance in Supply Chain
Usama Awan

The results indicate that socially sustainable development is two-fold: firstly, in-volves fostering interaction through relational governance and secondly, ensur-ing cohesion with cultural intelligence capability. We develop a theoretical framework and empirical research approach for understanding how cultural intel-ligence capabilities can be used to transform relational governance to improve social sustainability in an inter-firm exchange relationship. The analysis is based on cross-sectional base survey questionnaires on a sample of 239 senior manag-ers from four manufacturer industries using partial least squares structural equa-tion modelling approach.

Sustainability performance framework is conceived on a foundation of the theoretical body of knowledge in the literature. This study contributes by identifying key cultural intelligence capabilities; management is more likely to work effectively with their cross-border supply chain partners. The dynamic capability theory helps explain how culturally intelligent individu-als are able to dynamically adjust, protecting and adapt to the partner cultural in inter-organizational collaborations. Our results through structural equation mod-elling approach confirmed that collaborative relational governance is useful to improve the social sustainability performance

Day 3, Tour

D3T: Guided Tour: BAALL Bremen Ambient Assisted Living Lab & B-Human Robot Soccer (DFKI Bremen)

Closing

Closing and Farewell (BIBA Auditorium)

Conference Dinner

Conference Venue

The LDIC 2018 will be held in the buildings BIBA and IW3, next to the tram stop (H) of the line no. 6. This tram connects the university with the main railway station, the city and the airport. The universities canteen (Mensa) can be reached by a short walk of five minutes.

This map shows how to get to the Bremer Ratskeller, where the conference dinner is taking place.

Map

How to get to the Bremer Ratskeller

1. Take the tram (line no. 6, direction „Flughafen/ Airport") at the "Klagenfurter Straße" (tram stop next to the BIBA building). The transfer takes approx. 30 minutes.

2. Get off at the stop "Domsheide / City Center".

3. Turn left at McDonalds and follow the tracks until you reach the Bremer Ratskeller (see picture below).

Address: Hochschulring 20, 28359 Bremen

Address: Am Markt, 28195
Entrance to the Ratskeller on this side

Ratskeller

LDIC 2018: IW3/BIBA

LDIC

walking distance: ~3 min

Cartesium: Guided tours

Mensa: Lunch

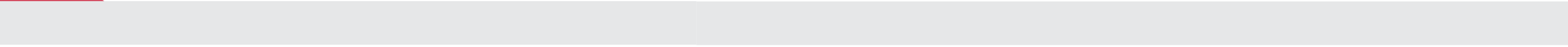tram route: ~30 minutes

Domsheide Station

**Conference
Rooms**

Map

All sessions of LDIC 2018 take place in BIBA on the first floor (BIBA Auditorium and BIBA Conference Room) and in IW3 on the ground floor (IW3 Auditorium). The guided tours take place in the building Cartesium.

Conference App

Wi-Fi access
is available at
the registration desk

IW3

WC
WC

IW3
Auditorium

Klagenfurter Straße

H

N
W E
S

BIBA

WC
WC

WC
WC

Hall
Coffee Break
Registration

BIBA
Auditorium

Stairs   Lift

Meeting Point
Guided Tour

BIBA
Conference Room

Entrance

Entrance

Hochschulring