

Systemic Decision Business Opportunities Model

Systemic
Decision
Business
Opport.
Model

B. Heiden et
al.

Content

Introduction

Trend QC

- (a) Business opportunities
- (b) Technology
- (c) Derivation
- (d) Business intelligence tool
- (e) Applications

Summary and
Outlook

Bibliography

*

FH-Prof. Mag. DI Dr. Bernhard Heiden, MBA
FH-Prof. DI Dr. Josef Tuppinger

Dr. Petra Hössl

FH-Prof. DI Dr. Erich Hartlieb
Marissa Schwarz
Stefan Kandutsch
MMag. Bianca Tonino-Heiden

Studiengang Wirtschaftsingenieurwesen (WING/IEM) & Maschinenbau
(MB), FH-Kärnten

12/07-08/2021, Online (Bahrain)

THE 2021 INTERNATIONAL CONFERENCE
ON DECISION AID SCIENCES AND
APPLICATIONS (DASA'21)
12-13 July 2021, Bahrain



1 Content

2 Introduction

3 Trend QC

- (a) Business opportunities
- (b) Technology
- (c) Derivation
- (d) Business intelligence tool
- (e) Applications

4 Summary and Outlook

5 Bibliography

Bibliography Literatur

Systemic
Decision
Business
Opport.
Model

B. Heiden et
al.

Content

Introduction

Trend QC

- (a) Business opportunities
- (b) Technology
- (c) Derivation
- (d) Business intelligence tool
- (e) Applications

Summary and
Outlook

Bibliography

*

Introduction

Motivation and Introduction:

- Quantum Computing (QC) → highly back coupled systems
- Decision Problem: When and where to apply high business investments

Method and Goal:

- Systems Theory, Orgiton Theory: Cybernetic elements of *information, energy and mass*
- System theoretic tool:
Systemic Decision Business Opportunities Model → how to build systems with increasing social mass impact
- Examples QC

Systemic
Decision
Business
Opport.
Model

B. Heiden et
al.

Content

Introduction

Trend QC

(a) Business
opportunities

(b) Technology
(c) Derivation
(d) Business
intelligence tool
(e) Applications

Summary and
Outlook

Bibliography

*

Trend QC

Business Opportunities

- Kirzner's theory → discovery
- Schumpeters theory [6] → creation
- Market imperfections as base

3 Types:

- Discovered entrepreneurial opportunities (divers \rightleftharpoons , existing): product \wedge market exists
- Discovered entrepreneurial opportunities: (monoverse \rightarrow) one side - product \vee market exists
- Created entrepreneurial opportunities: (0-verse \rightarrow) 0-side - \neg (product \wedge market) exists

- Efficiency shift through QC → less energy consumption (informational gain vs. energy effort)
- Material and structure development: e.g. GaN as better semiconductor compared to SiC → feedback loop
- Actual instable, hight error rate, energy for compensation
- Social mass inertia → global → 'giant like' to start

(1) Logistic Curve¹ - S-Curve, Lotka-Volterra

$$\frac{dY}{d\tau} = k \cdot Y \cdot (Sat - Y) \quad (1)$$

- (2) Fluidisation-Solidification-Theorem [9]: social gravitational field, osmotic paradigm [10] → social mechanics
- (3) Goal Map: Can be regarded as a cybernetic tool of one virtual mass, with a mass centre; e.g. hyperswarms [16] (glocal properties: local and global control simultaneously)

¹s.a.[19]

• virtual third dimension

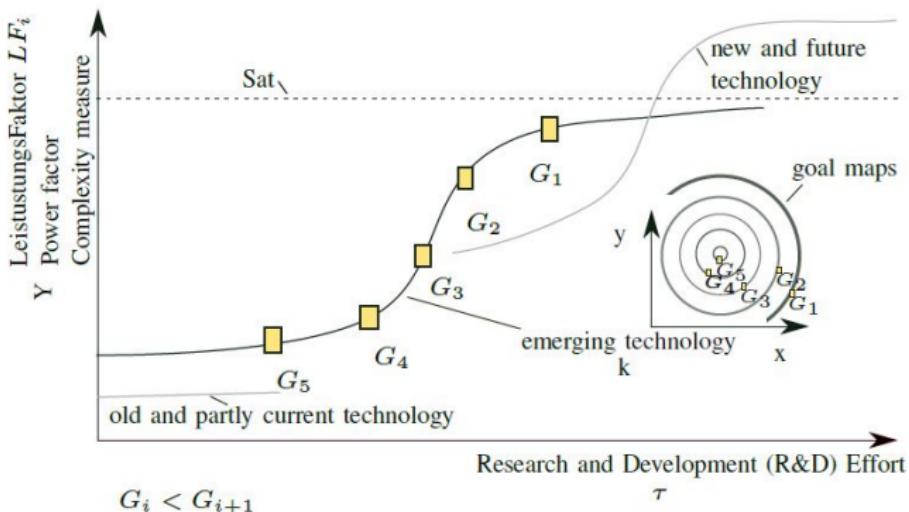


Figure 1: General business intelligence tool for technology trends; E.g. QC; future goal dimensions - and business gravitational strategic field G_i .

Applications

Systemic
Decision
Business
Opport.
Model

B. Heiden et
al.

Content

Introduction

Trend QC

- (a) Business opportunities
- (b) Technology
- (c) Derivation
- (d) Business intelligence tool
- (e) Applications

Summary and
Outlook

Bibliography

*

- Social fields, climate, urbanisation, digital transformation, pharmaceutical industry, traffic routing, energy distribution, network stability, security
- Ammoniac synthesis, now energy consuming → could find new chemical synthetisation → energy savings
- Quantum computer
 - → ion trap, 24 qubit Infineon Technologies AG
 - 100 qubit IBM
 - IonQ \$2 Billion, NY Stock Exchange
 - Rigetti Computing \$1.5 Billion, Berkely, California

Systemic
Decision
Business
Opport.
Model

B. Heiden et
al.

Content

Introduction

Trend QC

- (a) Business opportunities
- (b) Technology
- (c) Derivation
- (d) Business intelligence tool
- (e) Applications

Summary and
Outlook

Bibliography

*

Summary and Outlook

Summary and Outlook

- Business Opportunities Models
- Derivation from orgiton theory/system theory - cybernetic theory of mass, energy and information
- Introduction to systemic business opportunities model
- Example QC

Outlook

- Further applications
- High investments ↑ → importance of simulation, system theoretic modelling for fast, overall decisions ↑
- Effect on societal gravitational impact, mathematisation, energy & information
- Combination with mathematical tools, e.g. bifurcation analysis of dynamic systems in chaos theory

Systemic
Decision
Business
Opport.
Model

B. Heiden et
al.

Content

Introduction

Trend QC

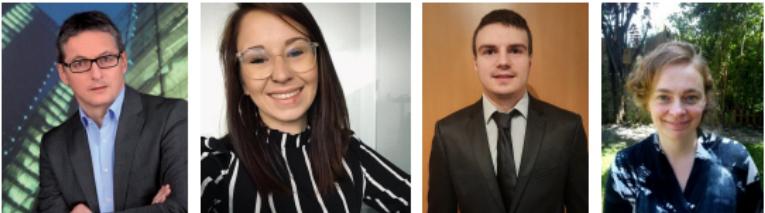
- (a) Business opportunities
- (b) Technology
- (c) Derivation
- (d) Business intelligence tool
- (e) Applications

Summary and
Outlook

Bibliography

*

Thank you cordially for your attention!



FH-Prof. Mag. DI Dr. Bernhard Heiden¹, MBA, FH-Prof. DI Dr. Josef Tuppinger, Dr. Petra Hössl, FH-Prof. DI Dr. Erich Hartlieb, Marissa Schwarz, Stefan Kandutsch & MMag. Bianca Tonino-Heiden

¹Professor for Production Engineering

E-Mail: b.heiden@cuas.at

PS.: The presentation can later also be found at:

<http://www.dr-heiden.com/Vortraege.htm>

Bibliography I

-  Philip Ball. "First quantum computer to pack 100 qubits enters crowded race". In: *Nature* (2021). DOI: [10.1038/d41586-021-03476-5](https://doi.org/10.1038/d41586-021-03476-5).
-  Chen, Z., et al. "Exponential suppression of bit or phase errors with cyclic error correction". In: *Nature* 595.7867 (2021), pp. 383–387. DOI: [10.1038/s41586-021-03588-y](https://doi.org/10.1038/s41586-021-03588-y).
-  Deutscher Bundestag. *Energieverbrauch bei der Produktion von mineralischem Stickstoffdünger*. last accessed 31 Aug 2021. 2018. (Visited on 08/31/2021).

Bibliography II



Jan Dönges. "Google demonstriert effiziente Quanten-Fehlerkorrektur". In: *Spektrum - Die Woche* 28 (July 14, 2021). last accessed 31 Aug 2021. URL: <https://www.spektrum.de/news/quantencomputer-google-demonstriert-quanten-fehlerkorrektur/1895635> (visited on 08/31/2021).



J.T. Eckhardt and S.A. Shane. "Opportunities and entrepreneurship". In: *Journal of management* 29 (2003).



Urs Fueglistaller et al. *Entrepreneurship. Modelle – Umsetzung – Perspektiven. Mit Fallbeispielen aus Deutschland, Österreich und der Schweiz.* 4th ed. Springer Verlag, 2016 (cit. on p. 6).



Dietmar Grichnik et al. *Entrepreneurship unternehmerisches Denken, Entscheiden und Handeln in innovativen und technologieorientierten Unternehmen.* 2nd ed. Lehrbuch. Stuttgart: Schäffer-Poeschel Verlag. ISBN: 9783791036601.



Frank Grotelüschen. *Wettstreit der Systeme.* Deutschlandfunk, last accessed 31 Aug 2021. July 12, 2021. (Visited on 08/31/2021).

- (a) Business opportunities
- (b) Technology
- (c) Derivation
- (d) Business intelligence tool
- (e) Applications

Bibliography IV



Bernhard Heiden and Bianca Tonino-Heiden. "Emergence and Solidification-Fluidisation". In: *Intellisys 2021, LNNS 296. Intelligent Systems Conference (Intellisys) 2021*, Amsterdam, The Netherlands, fully virtual conference, 2-3 September 2021. Ed. by Kohei Arai. Lecture Notes in Networks and Systems. Springer Nature Switzerland AG, 2022, pp. 845–855. DOI: [10.1007/978-3-030-82199-9\57](https://doi.org/10.1007/978-3-030-82199-9_57). in print, planned for presentation (cit. on p. 8).

Bibliography V

Systemic
Decision
Business
Opport.
Model

B. Heiden et
al.

Content

Introduction

Trend QC

- (a) Business opportunities
- (b) Technology
- (c) Derivation
- (d) Business intelligence tool
- (e) Applications

Summary and
Outlook

Bibliography

*



Bernhard Heiden et al. "Framing Artificial Intelligence (AI) Additive Manufacturing (AM)". In: *Procedia Computer Science*. 14th International Symposium "Intelligent systems" (INTELS'20), 14.-16. Dec. 2020 (Lomonosov Moscow State University, Online). Vol. 186. Moscow, Russia: Elsevier B.V., 2021, pp. 387–394. DOI: 10.1016/j.procs.2021.04.161. URL: <<http://intels-conf.ru/>> (cit. on p. 8).



Robert C. Hilborn. *Chaos and Nonlinear Dynamics - An Introduction for Scientists and Engineers*. Oxford University Press, New York, 1994.



Niklas Luhmann. *Soziale Systeme*. 17th ed. Suhrkamp Verlag AG, 2018. 675 pp. ISBN: 3518282662.



Christian Meier. *Eine kurze Geschichte des Quantencomputers : Wie bizarre Quantenphysik eine neue Technologie erschafft.* Hannover: Heise Zeitschriften Verlag, 2015. ISBN: 9783944099064.



Gaudenzio Meneghesso, Matteo Meneghini, and Enrico Zanoni, eds. *Gallium Nitride enabled High Frequency and High Efficiency Power Conversion.* Springer International Publishing, May 24, 2018. 248 pp. ISBN: 3319779931.

Bibliography VII



Jon Porter. *Google wants to build a useful quantum computer by 2029*. Last accessed 31 Aug 2021. May 19, 2021. URL: <https://www.theverge.com/2021/5/19/22443453/google-quantum-computer-2029-decade-commercial-useful-qubits-quantum-transistor> (visited on 08/31/2021).



Louis Rosenberg et al. "From Swarms to Hyperswarms: A New Methodology for Amplifying Group Intelligence". In: *Proceedings of the Future Technologies Conference (FTC) 2021, Volume 1*. Springer International Publishing, 2021, pp. 239–251. DOI: [10.1007/978-3-030-89906-6_17](https://doi.org/10.1007/978-3-030-89906-6_17) (cit. on p. 8).

Bibliography VIII

Systemic
Decision
Business
Opport.
Model

B. Heiden et
al.

Content

Introduction

Trend QC

- (a) Business opportunities
- (b) Technology
- (c) Derivation
- (d) Business intelligence tool
- (e) Applications

Summary and
Outlook

Bibliography

*

-  Clemens Rössler. *Trapped-Ion Quantum Computing*. Report at Infineon Technologies Austria AG. Infineon Technologies Austria AG, 2021.
-  Sarasvathy, S. D. et al. "Three Views of Entrepreneurial Opportunities". In: *Handbook of Entrepreneurship Research. An Interdisciplinary Survey and Introduction*. Kluwer Academic Publishers, 2003.
-  Alexander Soldov and Valery Ochkov. *Differential Models*. Springer Verlag, 2005 (cit. on p. 8).
-  Dominic Tilly. "Characterisation of Defects in Gallium Nitride Structure Using Conductive Atomic Force Microscopy". Carinthia University of Applied Sciences (CUAS). MA thesis. Villach: Carinthia University of Applied Sciences (CUAS), Aug. 19, 2021.

Bibliography IX



Ludwig von Bertalanffy. *General System Theory*. Revised Edition. New York: George Braziller, 2009.



John von Neumann and Oskar Morgenstern. *Spieltheorie und wirtschaftliches Verhalten*. Ed. by F. Sommer. Trans. by M. Leppig. 2nd ed. Würzburg: Physika-Verlag, 1967.