

# Analyzing Data Quality Investments in CRM -A Model-Based Approach-

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Research: **Business Information System Quality in**

- Integrated Information Systems
- Supply Chain Management
- Customer Relationship Management
- Health Care Information Systems



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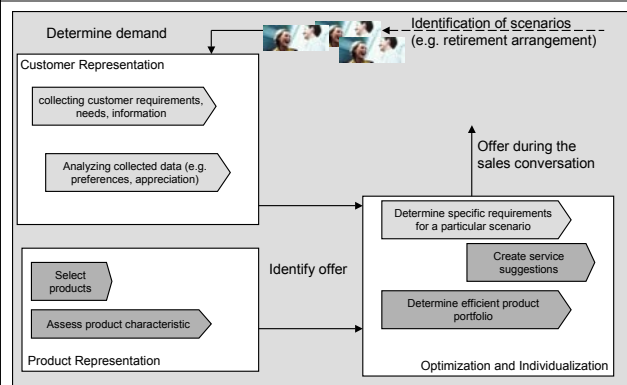
Research: • Information Systems Architectures  
• Customer Relationship Management  
• Data Quality and Data Mining  
• Process Management



## Outline

- Motivation and Background
- Definitions
  - Data Quality
  - Customer Relationship
- Investments in Data Quality for CRM
  - Model
  - Results and Interpretation  
(Level of significance and multiplication effect)
- Summary and Conclusion

## Background: Research Project at the University of Augsburg



DCU „Data Quality is important for CRM“

A Practical Example – CRM

- A huge investment for an organisation
  - If implemented well, can deliver tremendous ROI
- But
- 70% of CRM implementations fail
  - No. 1 reason for CRM failure -

**Data Quality!**

InfoAge Ltd (Kathy Hunter 2003)

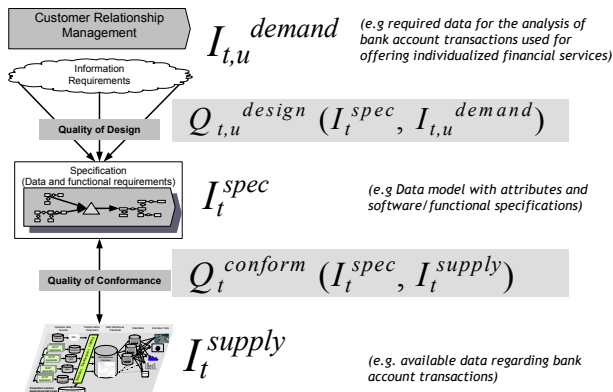
- Data quality should be a concern of anyone engaged in a CRM initiative. [ICRM 2002]
- Poor quality data is one of the most commonly cited reasons why CRM projects fail. [Eager 2001]
- The goals of CRM are to integrate and utilize all relevant data from every customer and prospect interaction; deliver such data to all in the organization who need it; better understand customers' value; improve the efficiency and effectiveness of interactions; and develop customer relationships and make them last longer. [Dubois 2001]

- Various publications assume an interdependence between data quality and customer relationship management
- Many authors *implicit* presume that high data quality enables better knowledge about the customer and thus consequently strengthens the relationship to its customers

DCU But ...

- What is a relationship-oriented customer interaction?
- What does data quality mean in the context of CRM?
- How can the interdependences between data quality and customer relationships be explained and modeled?
- To which extent should data quality be used for influencing customer relationships (⇒ effectiveness)?
- Compared with other measures in customer relationship (e.g. bonus systems, vouchers, trust building), how useful are measures in data quality?

DCU Data Quality



DCU Data Quality Management

$$Q_t^{total} = \sum_u Q_{t,u}^{design}(I_t^{spec}, I_{t,u}^{demand}) + Q_t^{conform}(I_t^{spec}, I_t^{supply}) \Rightarrow \max!$$

Assuming task dependent (⇒ predetermined) data requirements, direct data quality improvements:

- by an optimization of the specification  $I_t^{spec}$  (e.g. Data models, functional specifications)
- by an (qualitative) increasing of the data provided  $I_t^{supply}$  (e.g. Data provided by the IS)

Increasing the data supply  $I_t^{supply}$  can take place with measures of using and incorporating new data (e.g. completion of customer data, customer history) }  $D_{SUP} \in [0;1]$

A qualitative increase improving correctness by measures of data cleansing ⇒ Reactive data quality management }  $D_{QM} \in [0;1]$   
 improving completeness and correctness by measures of process improvement (e.g. modification of data collecting processes or data transfer/transformation processes). ⇒ Proactive data quality management

$$Q_t^{conform}(I_t^{spec}, I_t^{supply}(D_{SUP}, D_{QM}))$$

## DCU Customer Relationship

- „A series of transactions gradually transforms into a relationship, as a result of the **social exchange** between buyer and seller. A relationship is thus something **much more than a series of transactions**, and contains dimensions of **power, cooperation, commitment, and trust** to name but a few.“ [Eriksson/Fjeldstad01]
- „Despite more than ten years of academic and practitioner interest in this area, understanding of the nature of business to consumer relationships has **advanced little**. [...] Given the diversity in operational approaches employed, and the lack of accepted definitions, it has become impossible to delimit the domain. The boundaries are completely **permeable and elastic**.“ [O'Malley/Tynan01]
- Some authors emphasize the **long-term, economic objectives** of the partners as well as the investment character. Others state **exit barriers** (e.g. search costs, learning costs, risk) as characteristic for a relationship.
- **criteria? ⇒ Long-term, economic vs. social, emotional reasons, exit barriers?**

## DCU Customer Relationship

- **Transaction orientation:** Focus on single, transaction-based utility (cost/benefit) (e.g. price, product)
- **Relationship orientation:** Focus on comprehensive, overall utility (cost/benefit) (⇒ system effects)

Customer shares the total of his/her transactions among various providers (e.g. fuel purchases, financial investment)

$$e = \sum_i U_i(\lambda_i) - K_i(\lambda_i) + V_{H,i}(\lambda_i) + V_{A,i}(\lambda_i) \Rightarrow \max!$$

$$\text{mit: } \sum_i \lambda_i = 1$$

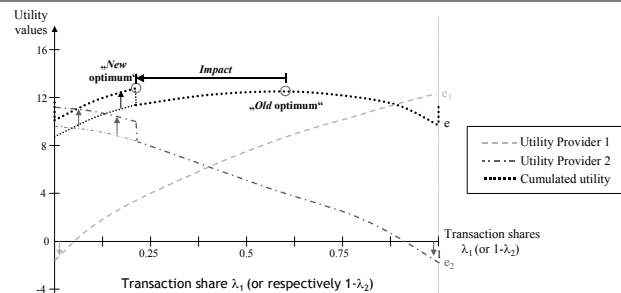
$\lambda_i$  = Transaction share completed at provider  $i$  (e.g. financial investment at a bank)

$U_i(\lambda_i), K_i(\lambda_i)$  = Single transaction dependent utility (cost/benefits)

$V_{H,i}(\lambda_i), V_{A,i}(\lambda_i)$  = System effects as transaction spanning utility (cost/benefits)

- without (provider's) intention (e.g. habituation, variety seeking) and
- with (provider's) intention (e.g. bonus, customized internet portal, generated trust)

## DCU Example



*A relationship is established (from a customer's view) as part of the interaction between a customer and a provider. A relationship is the result of at least two transactions that create benefit. In particular, a subsequent transaction results by the existence and relevance (not necessarily dominance) of provider intended system effects  $V_A$ .*

## DCU Implication of data quality on customer relationships

- Currently collected customer data, which are based on executed transactions (origin)
- Data used for current and future transactions (result)

⇒ Data quality as provider intended system effects  $V_A$

$$V_{A(DQ)} = a \times \lambda \times D_{SUP}^\alpha \times D_{QM}^\gamma$$

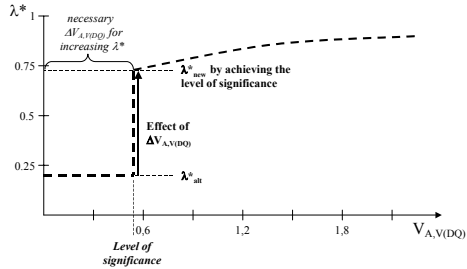
$D_{SUP}$  = available customer data

$D_{QM}$  = intensity of data quality management measures

$a, \alpha, \gamma$  = characterizes the customer type: The parameters indicate, how a customer (type) perceives „better“ data of his/her person (e.g. how he/she appreciates data used for sales recommendations).

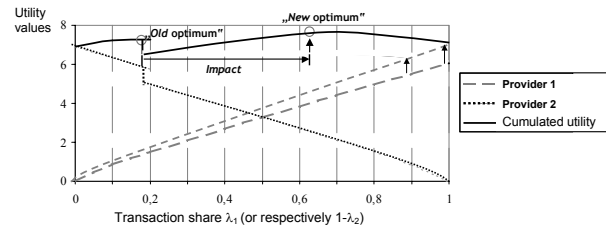
### Graphical illustration: Level of Significance and multiplication effect

System effects  $V_A$  and the transaction share  $\lambda^*$



Additional transactions lead to an increased data, and thus the increase results again in additional system effects, ... → **Multiplication effect.**

### Example: Investments in data quality



Step	$D_{QM}$	$D_{SUP}$	$V_{V(DQ)}$	$\lambda_1^*$	$\lambda_2^*$
0	0	0.447	—	0.2	0.8
1	0.5 (Investment)	0.447	$1.004\lambda$	0.713	0.287
2	0.5	0.844	$1.67\lambda$	0.772	0.228
3	0.5	0.879	$1.724\lambda$	0.776	0.224
4	0.5	0.881	$1.728\lambda$	0.776	0.224

### Effectiveness for alternative data quality measures

- But is  $D_{QM} = 0.5$  effective?
- Reduction of  $D_{QM}$  from 0.5 to 0.22 (about 56%) results in a decreased transaction share from  $\lambda^* = 0.775$  to  $\lambda^* = 0.711$  (only about 8%).
- To what extent should investments in data quality measures be taken?

For optimizing the effectiveness, it is necessary to determine the functional dependency between the transaction share  $\lambda^*$  and the data quality intensity  $D_{QM}$  (with  $q (= s \times b \times a) < 1$  and  $t \rightarrow \infty$ )

$$\lambda_T^* := \lim_{t \rightarrow \infty} \lambda^* = (m \times D_{QM}^t)^{\frac{q-1}{q}} \Rightarrow \lambda_T^* = (m \times D_{QM}^t)^{\frac{1}{1-q}}$$

geometric series

Analyzing the derivations, it is possible to determine the effective investment in data quality measures (e.g. at  $D_{QM} = 0.22$ )

$\Delta D_{QM}$	<0.22	0.22	0.35	0.5
$\Delta \lambda^*$	0	0.511	0.547	0.575
$\Delta \lambda^* / \Delta D_{QM}$	0	2.32	1.56	1.15

### Summary and Conclusion

- Positive effect of data quality measures in the CRM are not necessarily provided:
  - Requires a customer's affinity for data quality, i.e. the customer perceives utility of storing and using his data
  - Requires that the created utility exceeds a level of significance
  - Reaction of competitors (e.g. utilization of other instruments)
- In contrast to other relationship values, like confidence or monetary incentives, data quality measures initiated system effects are multiplied by qualitatively higher customer data (multiplication effect)

- ⇒ Comparison to alternative relations instruments (e.g. Bonus systems, monetary incentives)
- ⇒ Reinforcement of the multiplication effect by comprehensive DQM

Thank you!

