Leveraging Data Analytics and the Internet of Things to transform Digital Marketing

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Aim of presentation…

- Aims to provide an approach to conceptually integrate processes, services and information technologies, in the light of the IoT proliferation.

Structure of presentation…

- Review Digital Marketing
- Introduce the Impact of IoT on Digital Marketing
- Illustrate the Methodology and the Modelling approach

Trends in Data Analytics

- Big Data
- Data Analysis techniques
- Internet of Things (IoT)

Digital Marketing…needs

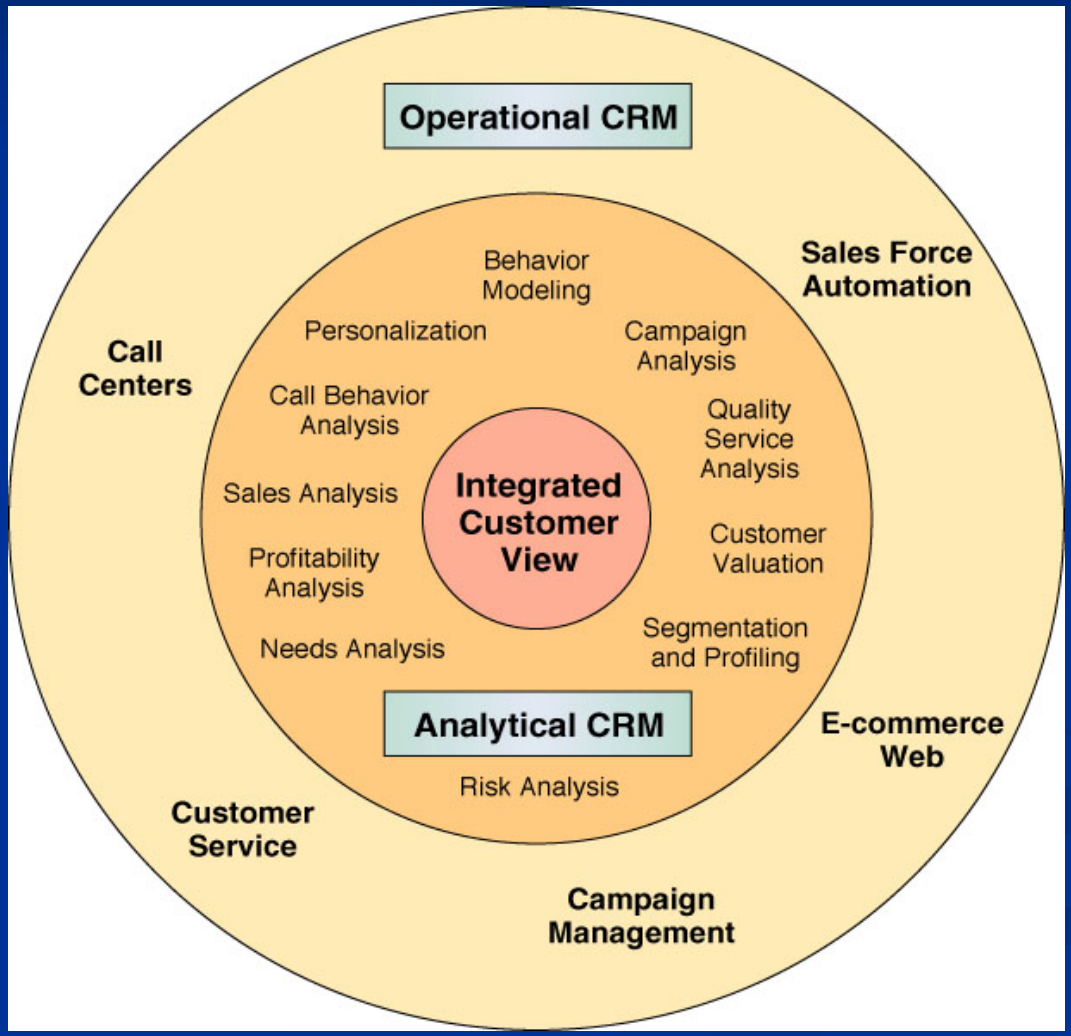
- to know more (or maybe everything?) about customer behaviour;
- to be able to assess the impact of its decisions and;
- Calculate the cost of revenue!!!

The RACE framework of Digital Marketing

- R: Reach - reaching customers and raising awareness on your site or other sites
- A: Act - achieving interaction
- C: Convert - conversion to sale online or offline
- E: Engage - long-term relationship building with customers

CRM, e-CRM systems are a big step forward…

Information Technology in CRM



What's the real value of CRM?

- CRM's real value is in **unifying an entire enterprise** based on its ability to sell, serve and retain customers better than before.
- Has this unification of data been implemented?

…there is a missing link…

- …in the process of unifying customer data along the value chain; thus digital marketing accountability is weak.

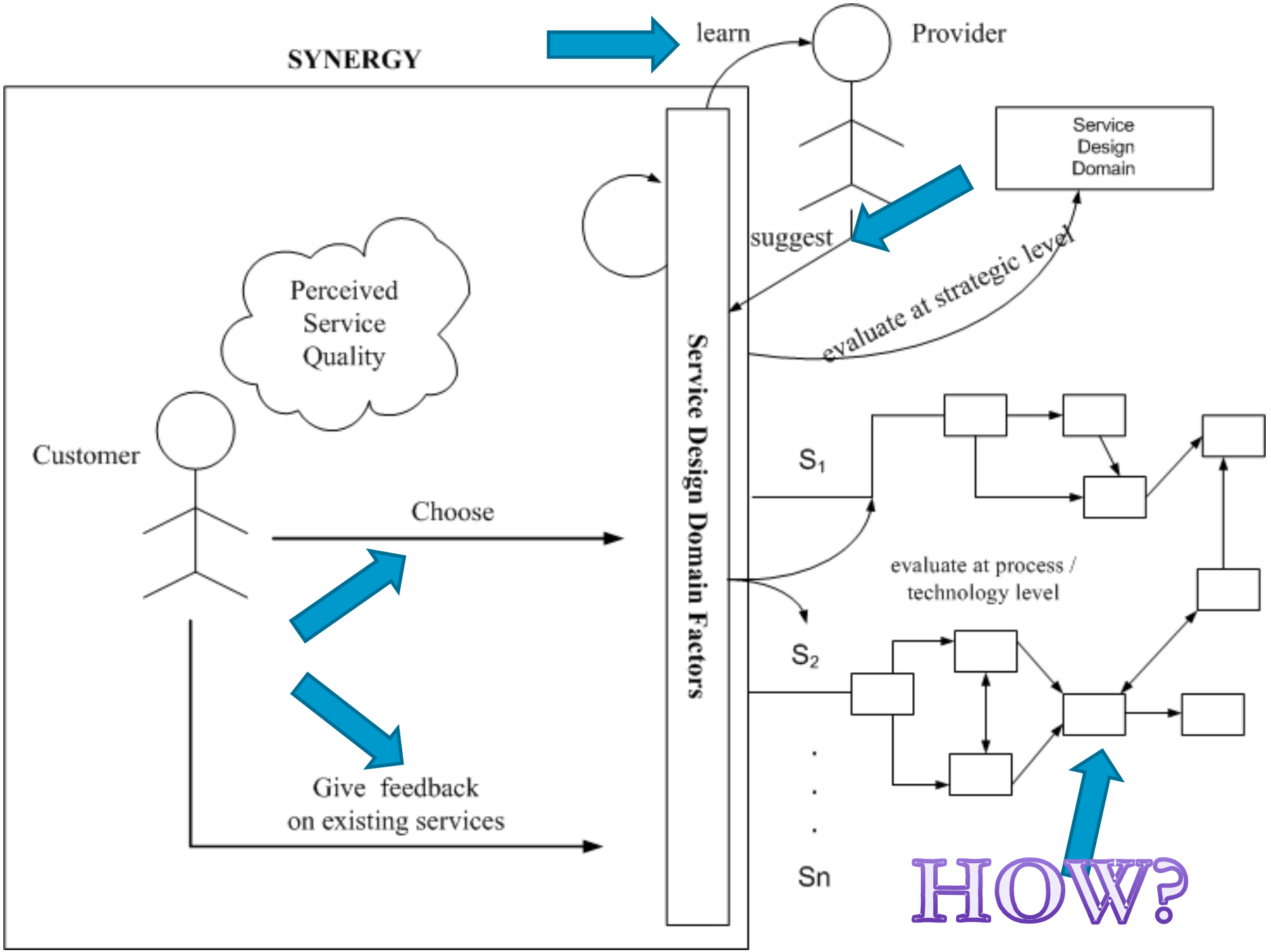
data sample in digital marketing… important data is missing

Ordered Impressions	* Served Impressions	Unique Impressions	* Clicks	* CTR	Unique Clicking Users	Ad Average Duration (Sec)

Average Viewability Duration (Agency)	Average Viewability Duration (Advertiser)	Average Viewable Surface Area	Average Screen Share	Cost per Viewable Second (Agency)	Cost per Viewable Second (Advertiser)

…ORACLE say …

- Data will increase by 80% in the next 5 years…
- However, Professionals use less than 50% of the **available** data…(what available could really mean???)
- IoT and data analytics may be the answer.


SYNERGY
learn
Provider
Service
Design
Domain
suggest
evaluate at strategic level
Perceived
Service
Quality
Customer
Choose
Service Design Domain Factors
S1
S2
Sn
evaluate at process /
technology level
Give feedback
on existing services
HOW?

Digital Transformation is a priority

- Given the future importance of digital marketing, many larger organisations have introduced Digital Transformation programmes to help manage these challenges.

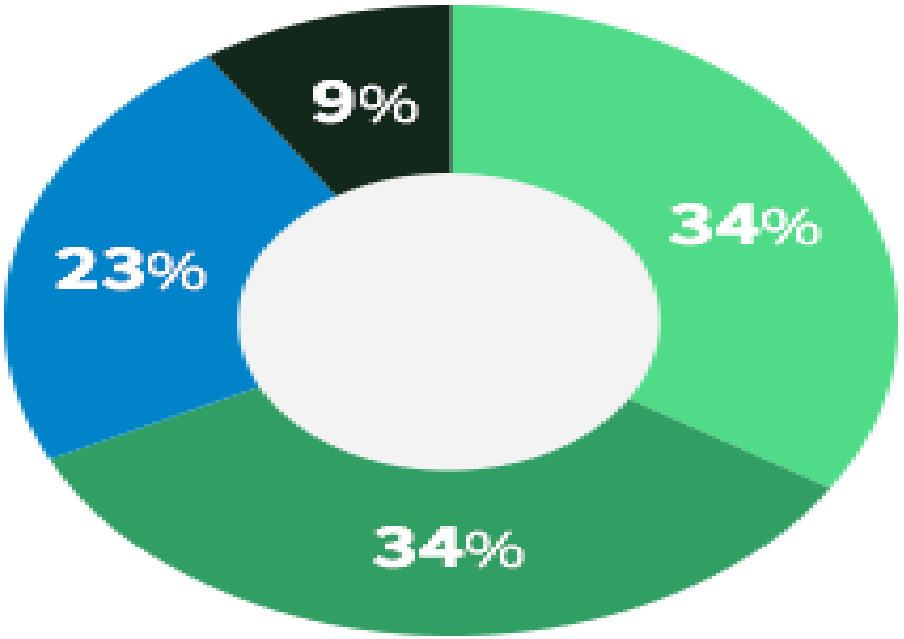
Digital Transformation …

- …is not just to review, optimize and transform existing processes and business models.
- It is to find completely new ways to conduct their business across numerous areas and functions.

Digital Transformation is essential to be able to

- Integrate digital marketing with the actual business processes.
- Derive a strategy and have the resources to exploit digital media and technology.
- To define a set of KPIs that is designed to facilitate performance improvement and to optimise digital marketing.

Adoption of digital transformation programmes in business



- We have no plans to run a digital transformation programme
- We have just started a digital transformation programme (within the last 2 years)
- We are planning to introduce a programme within the next 12 months
- We have had a digital transformation process in place for > 2 years

The Internet of Things (IoT) market size

- Predictions been made BusinessInsider, Forrester and Gartner, indicate that there will be
- around **34 billion devices** connected to the internet by 2020 and
- that nearly **$6 trillion will be spent** in the IoT sector over the next five years.

IoT… marketers expectations?

- 51% of the world's **top global marketers** expect that IoT will revolutionize the marketing landscape by 2020.

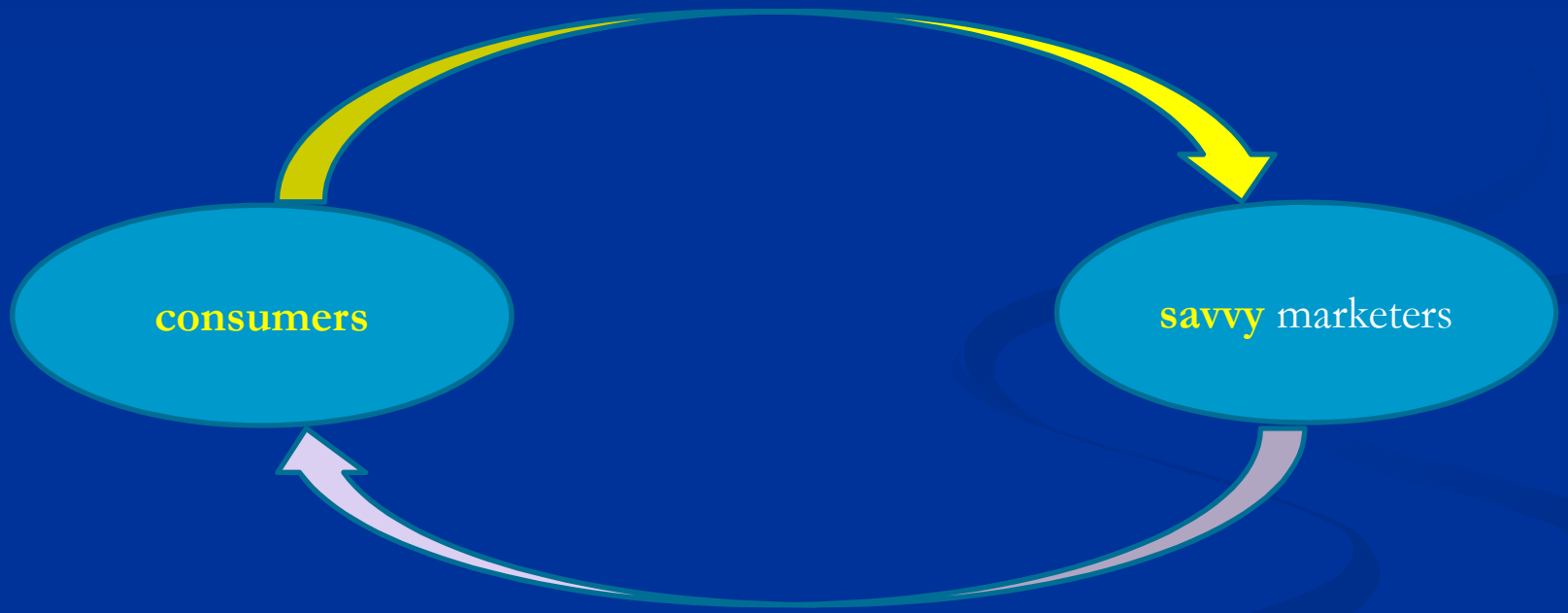
How will the IoT meet the expectations?

- **Provide connectivity** for better customer interactivity; thus improving customer experience
- **Provide More and previously Unobtainable data** across the value chain gained through connected devices and analytics.

- …Thus integrate customer, products and services with digital marketing decisions and actions.

…data will flow in both directions

Behaviour defining TRACKABLE data



Personalised Products/Services and Campaigns

IoT towards servitisation…I

- Technologies like **printed electronics** and sensors are rapidly changing the economics of connecting objects to the internet.

- Turning **products into data-driven, interactive media**; they become a platform for content, experiences and direct digital relationships with consumers.

IoT towards servitisation…II

- **Products-as-a-Service** personalized interactive services can talk directly to consumers and back to brand, personalizing to their preferences and self-improving over time as new digital services are added.

IoT Connected devices

- will give customers the incentive for sharing personal data (including **spending habits**, **location tracking** and **search history**)
- will provide data that will **lead to designing services and products**
- use data analytics to leverage this information to create **customized experiences for consumers**.

IoT Connected devices along the value chain

- Data can track product identity, …
- location and usage from factory floor
- to high street
- to living room and
- recycling back into component materials.

How IoT impacts Digital Marketing I

- The future of the Internet of Things is one in which the **point of sale is everywhere and anywhere**.
- **Real-time interactions**, e.g., targeted (and even **fully contextual**) ads.
- The customer service … where **issues can be quickly resolved**.

How IoT impacts Digital Marketing II

- Data is collected that captures sales conversion metrics and links them to **purchase-intent** data, establishing **causality**.
- The IoT offers the data-driven identification of marketing-to-sales accountability, **revealing the true cost of revenue**, which is the true Holy Grail of marketing.

IoT enables Context-Aware Recommender Systems

- Built to offer recommendations by taking into consideration IoT driven data streams:

- State of the user.
- State of the products.
- State of the computational environment.
- History of user-computer-environment.
- Interaction History of user purchased products.

Aim of Modelling approach

- To conceptually integrate Services with Customer behaviour and experience.
- Facilitate customisation in the light of the IoT.

Steps of the approach…

1. Define the features of the "ideal" (e-)service.
2. Capture customer behaviour and expectations.
3. Specify the process and tasks attributes engaged in delivering the "ideal" e-service.
4. Identify the required data and software components for implementing an e-service.

"Ideal" Service?

- Designing the "ideal" service requires a wide and innovative range of

- what to offer,
- when to offer,
- how to offer a service.

Step1: Define the features of the "ideal" (e-)service

- Services features reflect issues pertaining to service quality and are defined in the

- **Service Design Domain (SDD)…define KPIs that reflect the potential of technologies and reflect customers as possible…**

a) Customer Service Quality	b) Online Systems Quality
• Reliability • Responsiveness • Competence • Courtesy • Credibility • Access • Communication • Understanding customer • Collaboration • Continuous improvement	• Content • Accuracy • Ease of use • Timeliness • Aesthetics • Security

Service Design Domain refers to quality issues such as …I

- employee friendliness,
- delivery time, place and manner, etc,
- availability of a service feature e.g. piece of information,
- error avoidance,
- flexibility,
- time required for issue of service, etc.

and more…quality issues such as …II

- Customer retention rate
- New customer growth rate
- Average number of active products/services per customer
- Average time spent on solving problems occurring during transactions
- Number of critical comments from customers dissatisfied with products/services

Modelling Services I

- Let S(i) be a service.
- A service consists of a set of service features C_n
- Then S(i)=[C_1, C_2, C_3, …, C_n].

Modelling Services II

- Each service feature Ck, is modelled in terms of two characteristics, namely:

- The **fuzzy set importance (i)** of a particular feature Ck to a corresponding service quality S(i).
- The **fuzzy set degree of presence (p)** of a particular feature C(k) in a service S(i).

Modelling Services III

- Therefore services are modelled as:
- S(i)=[C1(i, p), C2(i, p), C3(i, p), …, Cn(i, p)].
- If a service feature is not part of a service then its presence (p) degree=0.

Step 2: Capture Customer Behaviour and Expectations I

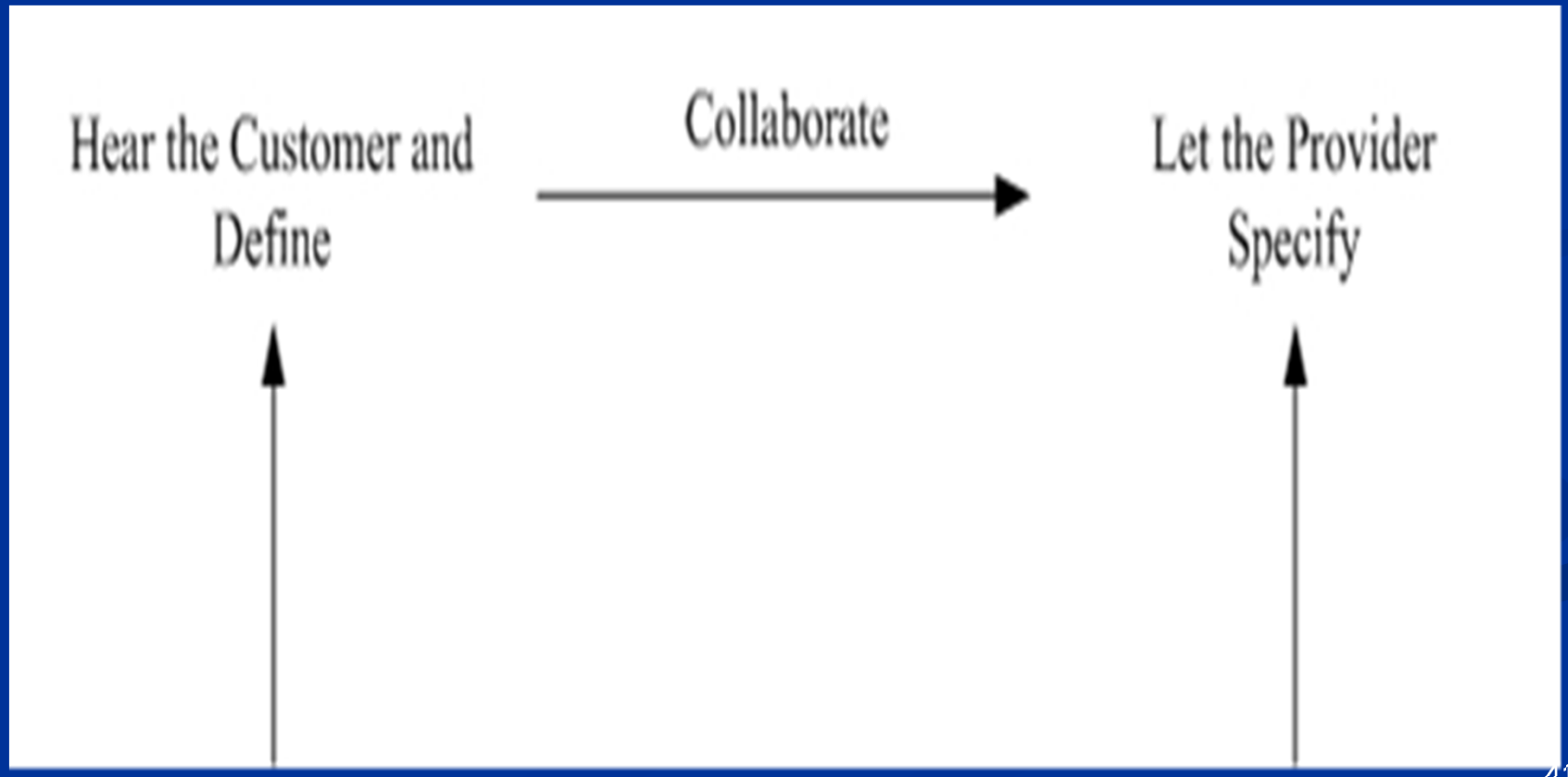
- Modelled also in terms of SDD; that is customer behaviour and requirements measured in terms of… employee friendliness, service personalization, error avoidance, flexibility, time required for issue of service, etc.
- **IoT could** be used to tracking data related to the customer behaviour.

Capturing Customer Behaviour and Expectations II

- Customer (m) Behaviour and Expectations CE(m) are represented as a vector of service features.

- Therefore, CE(m)=[C1(e1), C2(e2), …, Cn(en)], where, (ei) indicates customer expectations from each service feature.

We need to listen and understand Customer behaviour

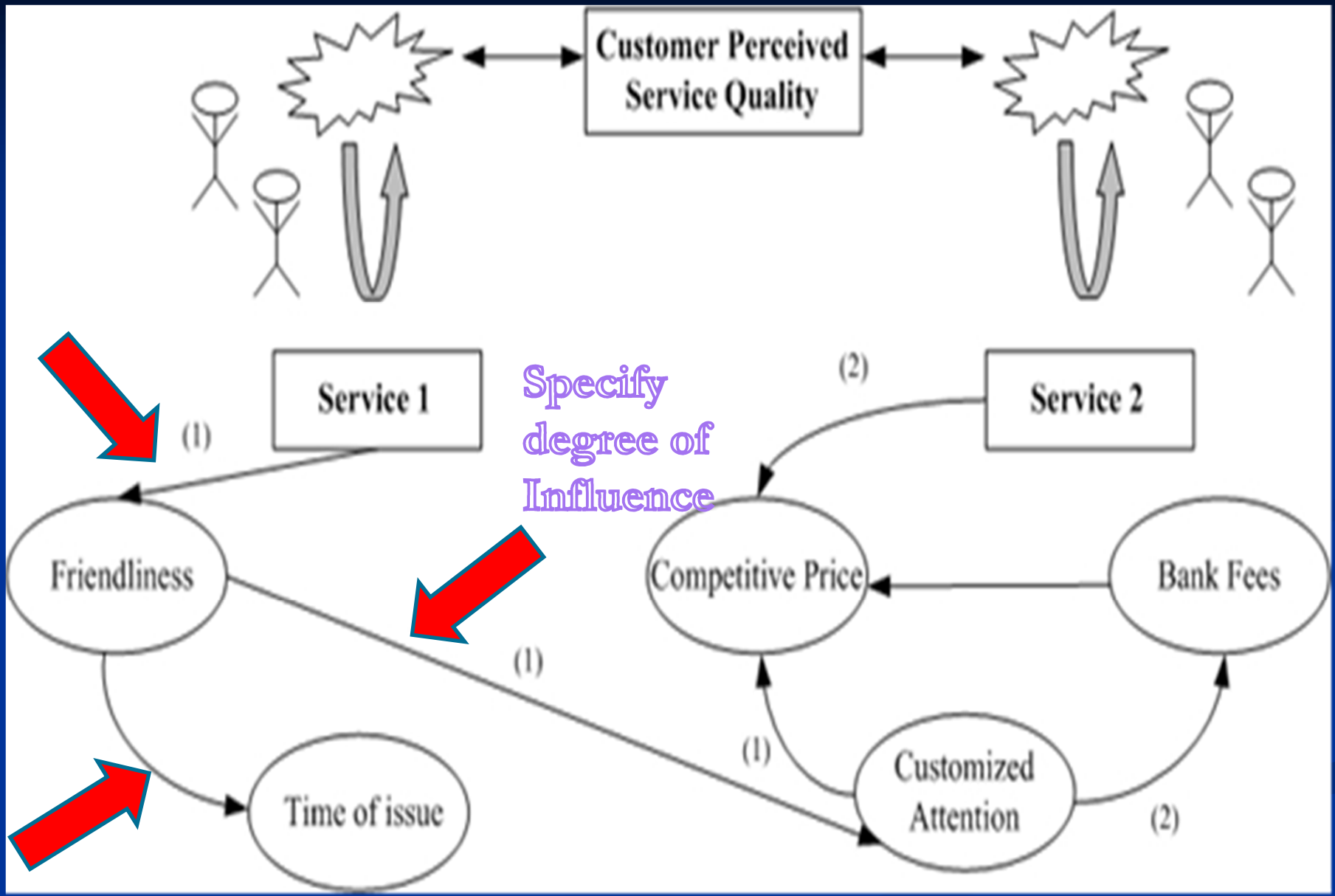


Modelling Service and Customer Priorities

- Apply multi-criteria methods.
- Services features, i.e. customer requirements are meant to be the criteria for assessing service quality, or customer satisfaction, experience, etc.

Applying DEMATEL

- DEMATEL (decision-making trial and evaluation laboratory).
- It can be used to specify **the importance of service features** (the marketers' view) as well as to estimate **the customer expectations for the corresponding service features.**


Customer Perceived Service Quality
Service 1
Service 2
(1)
(2)
Specify degree of Influence
Friendliness
Competitive Price
Bank Fees
(1)
(1)
Customized Attention
(2)
Time of issue

DEMATEL: Step 1

- Form the average matrix of experts responses.

$$Z = [z_{i,j}], i, j \in SDD$$

- Where $z_{(i,j)}$ indicate the degree each criterion (i) affects criterion (j), through pairwise comparisons.
- Criteria represent service features.

DEMATEL: Step 1.1

- Form the average matrix of experts responses…and/or customer reactions

$$Z = [z_{i,j}], i, j \in SDD$$

- Data reflecting selected KPIs **flow in** (in real time…), from both customers and/or marketers, thus continuously updating matrix Z.

DEMATEL: Step 1.2

- Data from customers and data from marketers produce a Z matrix for customers and another Z matrix for marketers.

$$Z = [z_{i,j}], i, j \in SDD$$

- The differences between customers' expectations and services features degree of presence, indicate the areas where attention is needed and customer supporting action should be taken.

Matrix Z: Example

	REDUCE COST	REVENUE GROWTH	CUSTOMER SATISFACTION	NEW CUSTOMERS	SALES	VIEWS	NATIONALITY	DEVICE	RETURNING USERS	PRODUCTS	NETWORK	NAVIGATION PROGR
REDUCE COST	0											
REVENUE GROWTH		0										
CUSTOMER SATISFACTION			0									
NEW CUSTOMERS				0								
SALES					0							
VIEWS						0						
NATIONALITY							0					
DEVICE								0				
RETURNING USERS									0			
PRODUCTS										0		
NETWORK											0	
NAVIGATION PROGR												0

DEMATEL: Step 2

- **Calculate the normalized initial direct- relation matrix D:**

$$D = \lambda * Z$$

$$\lambda = \min\left[\frac{1}{\max\sum_{j=1}^{n}(z_{i,j})}, \frac{1}{\max\sum_{i=1}^{n}(z_{i,j})}\right], \quad where 1 \le i \le n, 1 \le j \le n$$

DEMATEL: Step 3

- **Derive the total relation matrix T:**

$$T = (I - D)^{-1}$$

DEMATEL: Step 4.1

- Calculate the sums of rows and columns of matrix T

$$r = r_i[r_{i,j}]_{nx1} = (\sum_{j=1}^{n} t_{i,j}), \qquad c = c_j[c_{i,j}]_{1xn} = (\sum_{i=1}^{n} t_{i,j})$$

- The value of r(i) indicates the total given both directly and indirectly effects.
- The value of c(j) shows the total received both directly and indirectly effects.

DEMATEL: Step 4.2

- If (j = i), the value of (ri+ci) represents the total effects both given and received by factor (i).
- In contrast, the value of (ri-ci) shows the net contribution by factor (i) on the system.
- If (ri-ci) is positive, factor (i) is a net cause.
- If (ri-ci) is negative, factor (i) is a net receiver.

DEMATEL: Step 5

- **Set a threshold value (α)**

$$a = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}(t_{i,j})}{N}$$

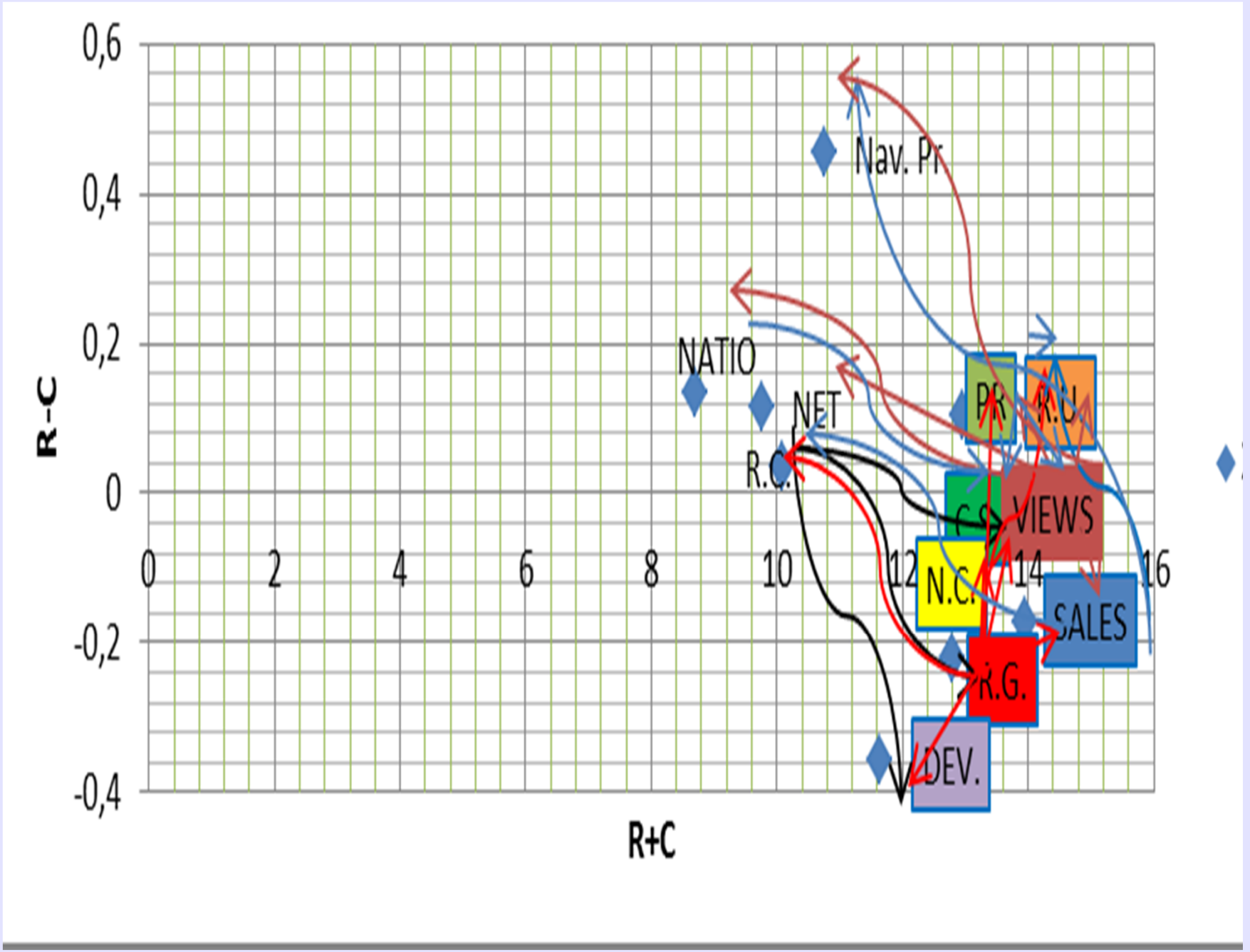
- Where N is the number of elements of T matrix.

DEMATEL: Step 6

- Build a cause and effect relationship diagram, by mapping all coordinate sets of

$$(r_i + c_i, r_i - c_i)$$

- which indicate **Importance** the most **important** factors **(service features)** and the degree of **influence** among factors.


0,6
0,4
0,2
0
-0,2
-0,4
R-C
0
2
4
6
8
10
12
14
16
R+C
Nav. Pr
NATIO
NET
R.C.
PR
R.C.
VIEWS
N.C.
SALES
R.G.
DEV.

The graph produced by DEMATEL represents a Fuzzy Cognitive Map, which is implemented as the Service Matrix

The Service Matrix

	KPI-1	**…**	**KPI-n**	C-1	**…**	C-k
KPI-1	0.0		-0.4	0.0	0.0	0.0
…		0.0		0.0	0.0	0.0
KPI-n			0.0	0.0	0.0	0.0
C-1	0.8					
…						
C-k						

Step 3: Specify process and tasks engaged in delivering the "ideal" e-service.

- Specify which Business Process(es) and tasks are responsible for implementing/supporting each service feature, i.e.

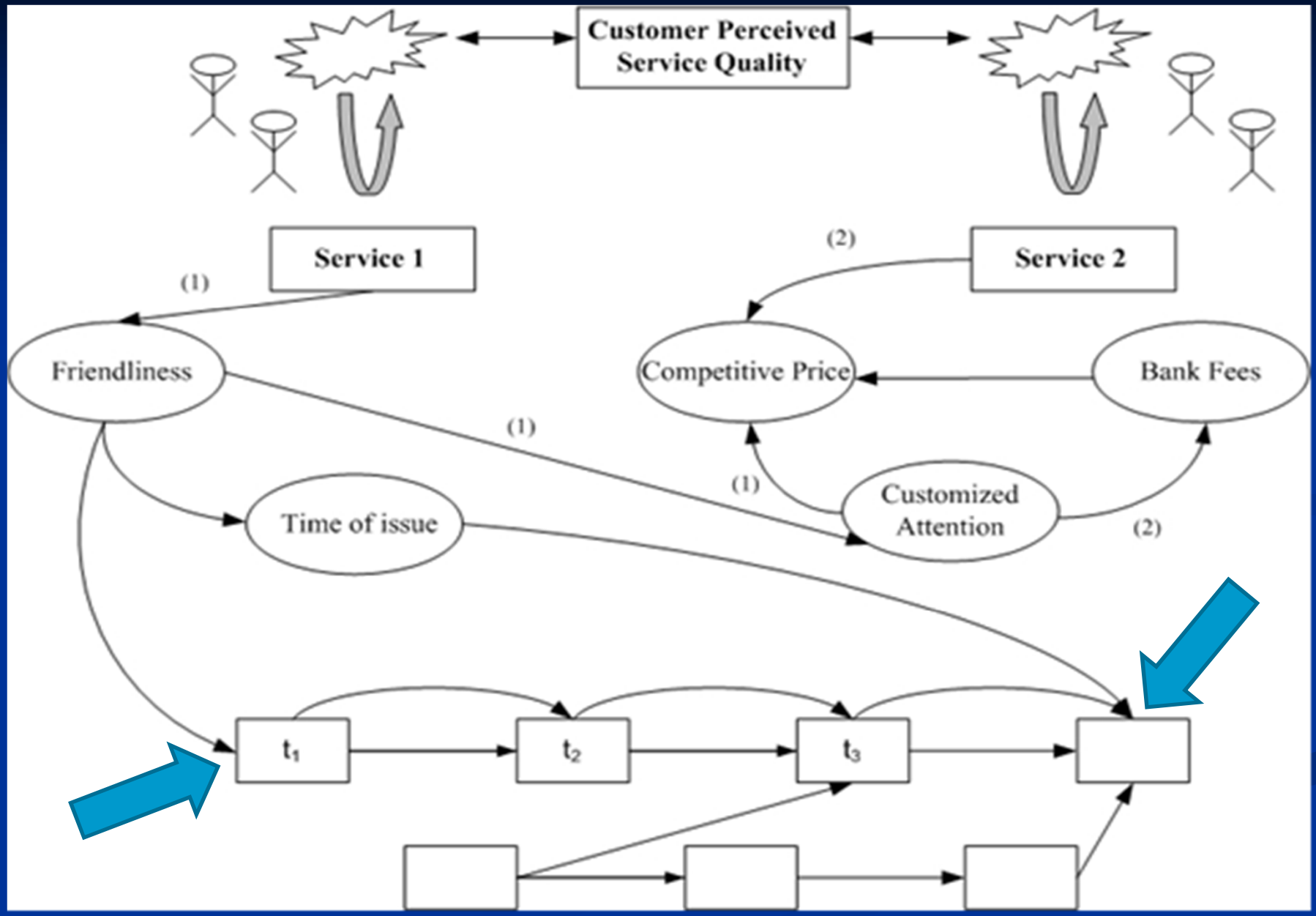
- How **process(es)/tasks (may) affect the realisation of each service feature**.

Every service (Si) is supported by a number of business processes

$$S_i = [P_1, P_2, \ldots, P_n]$$

- Each process is supported by a number of tasks, i.e.

$$P_p = [T_{p1}, T_{p2}, \ldots, T_{pt}]$$


Customer Perceived Service Quality
Service 1
Service 2
(1)
(2)
Friendliness
Competitive Price
Bank Fees
(1)
(1)
Time of issue
Customized Attention
(2)
t1
t2
t3

Expand the Service Matrix to include business tasks and form the Service-Task matrix.

The Service Tasks Matrix

	KPI-1	**…**	**KPI-n**	C-1	**…**	C-k	T-11	T12	…	Ttp
KPI-1	0.0		-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
…		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
KPI-n			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C-1	0.8									
…										
C-k										
T-11	+0.7			+0.8						
T12										
…										
Ttp										

Step 4:Identify the required data and software components for implementing an e-service.

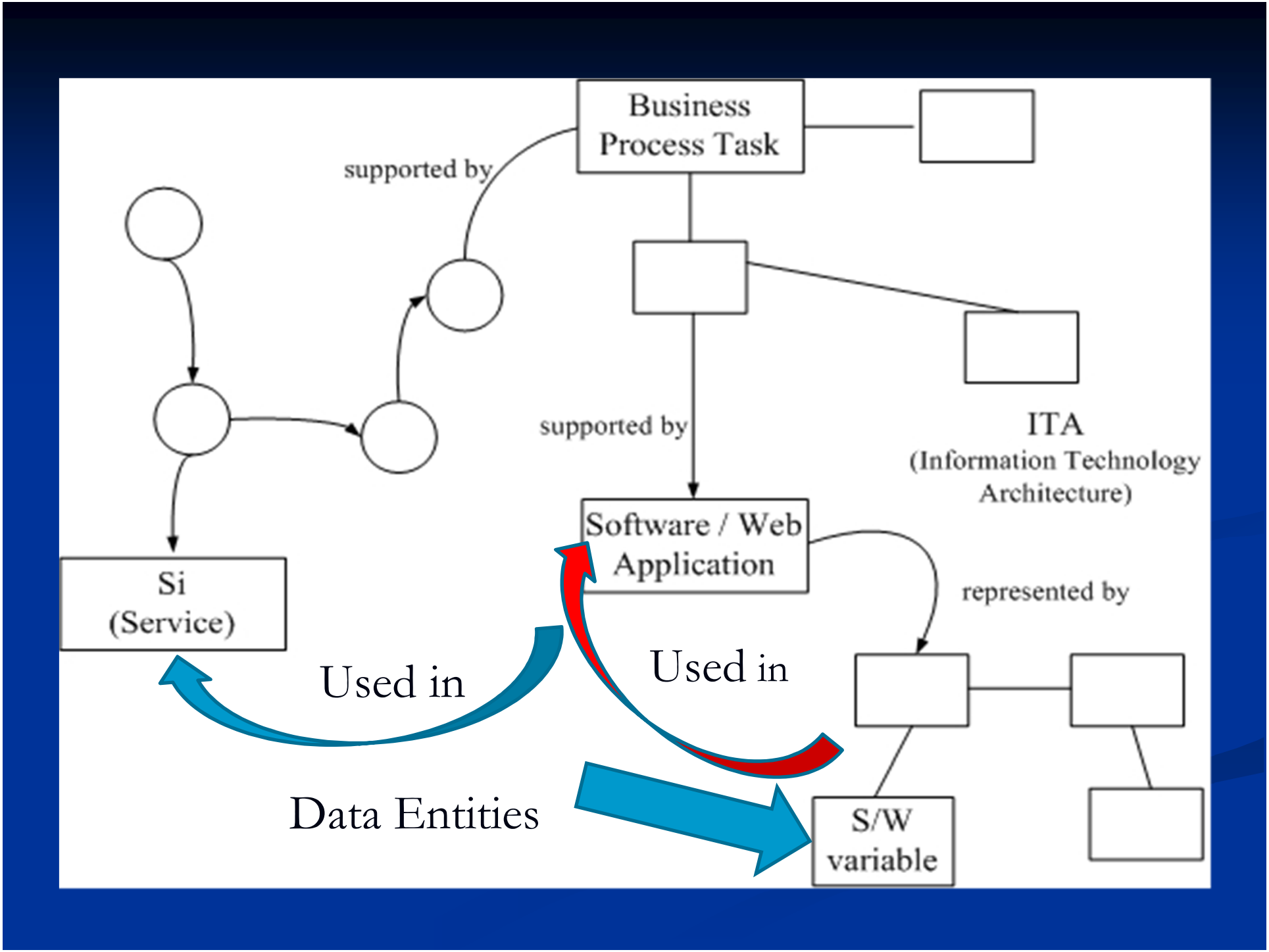
- Specify which Data Entities are responsible for implementing/supporting each service feature, i.e.
- How **Data Entities (may) affect the realisation of each task and each service feature**.

Every task(Ti) uses a number of data entities

$$T_t = [DE_{t1}, DE_{t2}, \ldots, DE_{tk}]$$

- Data entities represent data stored in data bases and are necessary for the implementation of services;
- They are used in software applications in order to create and deliver (e)-services.

Linking Services, Business Processes with Data and SW components.


Business Process Task
supported by
supported by
ITA
(Information Technology Architecture)
Software / Web Application
represented by
Si
(Service)
Used in
Used in
Data Entities
S/W variable

Data Entities are…I

- The data entities of a service are either
- input data (I) or
- output data (O) to the software that support service.

Data Entities Delivery Styles

- They are also associated with a Delivery style either an
- input or an
- output style

- that **specifies the way** that the data can be transmitted to and from the software that supports the service.

Data Entities Delivery Styles are…

- Delivery styles are used to define the communication channel(s) that are used to engage the service with other services or the customer.
- Delivery styles can be **e-mail, fax, web, mobile, person-to-person**, etc.

Expand the Service-Task matrix to include Data Entities and form the Service-Task-Data matrix.

The Service Tasks Data Matrix (STD)

	KPI-1	**…**	**KPI-n**	C-1	**…**	C-k	T-11	… Ttp	DE1	…	DEd
KPI-1	0.0		-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
…		0		0.0	0	0.0	0.0	0.0	0.0	0.0	
KPI-n			0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	
C-1	0.8										
…											
C-k											
T-11	+0.7			+0.8							
T12											
…											
Ttp											

Assume the activation vector (AV)

	KPI-1	…	KPI-n	C-1	…	C-k	T-11	… Ttp	DE1	…	DEd

- Required Action=AVxSTD;
- Multiply the AV with the STD matrix to estimate what is required to get involved, tasks and data entities in order to achieve s certain level of service quality.

Example…assume the following scenario I

- A person wakes up in the morning trying to start the coffee machine.
- Pressed the start bottom Two three times but nothing happen!!! The coffee machine is a smart one…seems not very reliable…
- …but not. The person presses the wrong button!!!

Example…assume the following scenario II

- The coffee machine realises the problem, transfers the data of "failing to start-wrong button" to the machine supplier…
- The service feature (KPI) could be "reliability" and/or "friendliness", need to be improved, which invokes task1 and task2 in process (P1).

Example…assume the following scenario III

- Data reveal Differences indicate action is needed.

- Service S(use coffee machine)=
{reliability(i=0.9; p=0.2); friendliness(i=0,75; p=0,2}

- Customer Expectations of
S(use coffee machine)={0,9; 0,8}.

Example…assume the following scenario IV

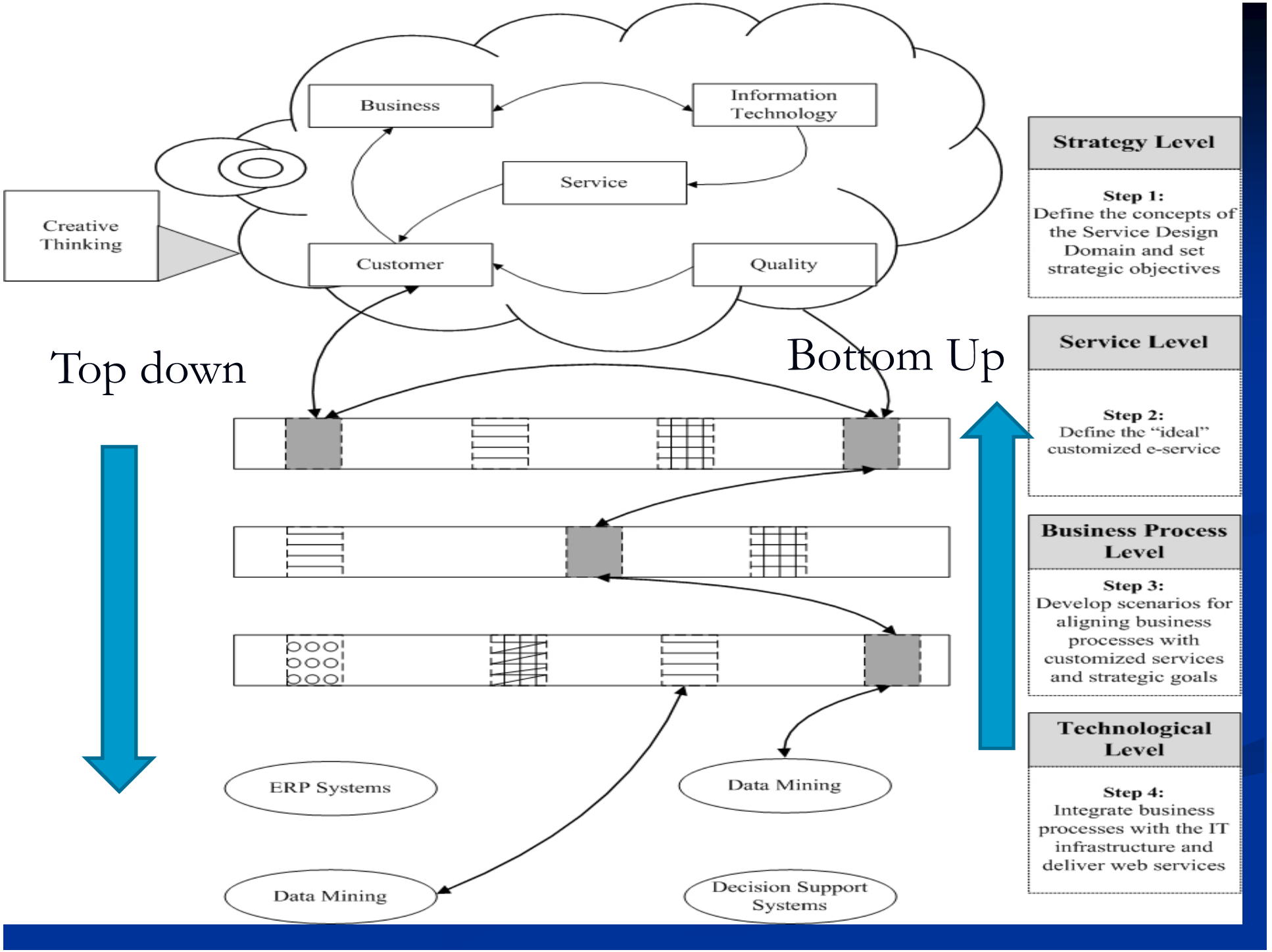
- For example, Task 1, which is responsible for the "reliability" of the machine is invoked, and sends
- a **message (Data Entity)**
- with **a video (Data Entity Style)**
- on the person's **mobile (Data Entity Style)** of pressing the wrong button.

Example…assume the following scenario V

- Similarly, data about the coffee consumption invoke another task …bakery…
- Digital marketing identifies the consumption habits and invokes the appropriate task for advertising (through the STD matrix).

Example…assume the following scenario VI

- It send then a targeted ad (Data Entity), with e.g. email (Data Entity Style)
- and a video on the mobile (Data Entity Style) to the person to promote supplementary to coffee products.
- …two complementary data entities were chosen…, with different levels of influence, etc.


Business
Information Technology
Service
Customer
Quality
Creative Thinking
Top down
Bottom Up
ERP Systems
Data Mining
Data Mining
Decision Support Systems
Strategy Level
Step 1: Define the concepts of the Service Design Domain and set strategic objectives
Service Level
Step 2: Define the "ideal" customized e-service
Business Process Level
Step 3: Develop scenarios for aligning business processes with customized services and strategic goals
Technological Level
Step 4: Integrate business processes with the IT infrastructure and deliver web services

Many Thanks