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Customer Empowerment 2.0

The Cost of Being Slow in Times of High Frequency Trading

How Prices can be set to allocate Grid Computing Resources in a Financial Service Institution

Design Thinking in Banking Services: Finding a radical new Innovation

GOETHE UNIVERSITÄT FRANKFURT AM MAIN

TECHNISCHE UNIVERSITÄT DARMSTADT

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Editorial

Customer Empowerment 2.0

Lars Hille

Lars Hille,
Member of the Board of Managing Directors,
DZ BANK AG

The changes that are currently leading us towards a world of interactive, personalized, dynamic media where everyone acts simultaneously, worldwide and "instantly" as both receiver AND transmitter, are tantamount to a global caesura. Information is now disseminated through a permanent stream of newly created channels at immense speed and often coming from unexpected directions. Internet communities are increasingly demonstrating the power of the Web to influence major projects such as Stuttgart 21 and to bring about radical political change in North Africa. Even popular revolts and revolutions can now be organized with practically no physical leadership – via social media.

This Web content is mostly generated by private individuals. Eyewitnesses take on the status of experts and use the Internet and Web 2.0 social media platforms to exchange information. However, these private individuals are also customers at the same time and they use the new web-based social communications not only to form their political opinions, but also to find recommendations and make purchasing decisions – which now more than ever include financial decisions.

Our capacity for rapid technological innovation, the spread of mobile devices and a significantly stricter regulatory climate are leading us at an increasingly faster rate away from the familiar world of manageable, allegedly secure one-way corporate communications. Power has already shifted towards the consumer: established customers and potential new customers alike now have the ability – any time, any place – to get information on the best-quality/best-value/most popular product. It is increasingly common for the public to rate a company's strategy, customer service and special offers online.

Although the gigantic scale of the information available, and its often superficial or summarized presentation leave question marks over the quality of online content, these customer responses do influence general perceptions as well as customers' future behavior. It is more essential than ever for companies to engage in comprehensive, continuous monitoring and to work ceaselessly to shorten their response times. To have a chance of future success, businesses must know, understand and be able to operate these new mechanisms. In the banking world, the lessons drawn from this sea change are still disparate and fragmentary: everyone is looking into the issue, but the practical outcomes are pretty indifferent. But whether the banks are keeping up or not, even if they are not actively promoting it, they are in the middle of a structural change process that goes beyond merely searching for information and opinions online. More and more customers now expect to be able to access their bank through both old AND new channels. Physical proximity – once the competitive advantage of "your local bank" – is becoming less and less relevant. Recent headlines have already signaled the first attempts by Internet businesses to sublimate the business model of traditional credit card operators and banks by replacing the established "customer – bank – producer" value creation chain with "customer – Google, Facebook, eBay – producer". We can expect falling transaction volumes for the credit card companies and the banks' payment handling units especially.

The risk that customers will be alienated from their branch bank, from the face-to-face meeting with their long-established adviser, and even from bank products per se in exchange for an inconceivable wealth and variety of online information and offers, needs to be kept in perspective in one respect: the ROPO effect (research online, purchase offline) may be changing customers' research and purchasing behavior, but customers will still only be fully satisfied when they feel well advised rather than just well informed, i.e., when they feel their wishes and needs are understood.

The cooperative idea is now more contemporary than ever: cooperative bank members are ALREADY part of an established, all-round social network. The challenge now is to build on this foundation to transfer our existing structures across the World Wide Web as part of a multi-channel strategy, and to successfully translate these various channels into an integrated customer-centered service concept. Our organization is already working on a series of projects that will bolt a growth story onto this issue in order to achieve our declared objective: Growing Together.

Research Report

The Cost of Being Slow in Times of High Frequency Trading

THIS PROJECT PROVIDES A PERFORMANCE MEASURE ON THE EFFECT OF LATENCY IN THE CONTEXT OF THE COMPETITIVE ADVANTAGE OF IT. BASED ON A DATASET OF DEUTSCHE BÖRSE'S ELECTRONIC TRADING SYSTEM XETRA, AN EMPIRICAL ANALYSIS IS APPLIED. THAT WAY, WE QUANTIFY THE IMPACT OF LATENCY FROM A CUSTOMER'S POINT OF VIEW.

Tim Uhle
Bartholomäus Ende
Moritz C. Weber

Introduction

In Q1/2009 Deutsche Börse reported 45% of all transactions on Xetra to originate from algorithms with increasing tendency (Deutsche Börse, 2009). The rationales for the success of algorithmic trading – with high-frequency trading (HFT) as a specific subgroup primarily focusing on proprietary trading with highest latency requirements – are plentiful: First, algorithms allow overall cost savings in comparison to human brokers (Domowitz and Yegerman, 2005). Second, they do not have human limitations and thus allow permanent surveillance of outstanding orders. This capability allows algorithms to readjust their trading decisions "immediately" to changing market conditions – e.g., by retaining unexecuted orders at best market prices (i.e. at the top of the order book) (Gsell and Gomber, 2009). Besides, algorithms have been proven to substantially enhance market liquidity, though the effects of HFT on welfare are ambiguous (Hendershott et al., 2011). Latency in trading has become a key competitive factor among marketplaces. They compete with ever faster access to their trading systems. From an IT business evaluation perspective, the following research questions arise: what are the effects of latency and do they require market participants to employ low latency technology? To provide market participants guidance in answering these questions, we develop a performance metric to measure the impact of latency on the risk of adverse order book changes consistently among different combinations of markets and instruments.

Every trader, human or algorithmic, has to cope with latency effects. When submitting an order at t_1, a decision must be made about limit and order size based on information generated at time t_0 (usually the order book, describing current bids and offers at the market). When the order reaches the market at time t_2, the situation at the market might have changed (cf. Figure 1). Our concept estimates the inherent risk of possible changes. Looking only at latency figures one can hardly derive the directly associated costs.

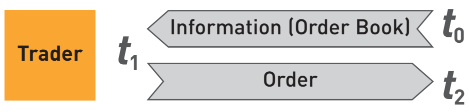

Figure 1: General dependence of a trader on latency

Since the future amount of order book changes and the impact on one's trading strategy are unknown, traders require a quantitative input to estimate the potential order book changes within the latency lag.

Order Book Fluctuations

For the estimation, we introduce the notion of order book fluctuations, which we define as the probability of an order book change within x milliseconds. In case no information about trading intentions is available, we cannot distinguish whether the fluctuations are favorable or unfavorable for the trader. Therefore, we define relevant changes for four basic strategies, buy active, buy passive, sell active and sell passive. These cases are chosen rather for demonstration purposes of the methodology than to simulate a real application on a complex algorithm. However, every strategy is a combination of these four basic strategies.

The difference between active and passive strategies refers to the application of marketable and non-marketable orders.

Finding estimators for the probability of order book changes is straightforward due to the model's simple structure. We use the relative frequency in which order book changes occurred in the past. Estimators for limit and volume changes can be derived by calculating the mean of the quoted volume and limit changes in the time span for which the probability is estimated.

Dataset

We choose Deutsche Börse's Xetra trading system for our analysis. Typically, algorithms are employed for instruments with high liquidity. Market capitalization is used as a proxy for liquidity. The 30 largest-capitalized instruments in Germany are represented in the DAX, and are thus used for the analysis at hand. The dataset comprises a two week sample of orderbook snapshots from 2009 and is taken from Thomson Reuters Data Scope Tick History.

Day Pattern in Order Book Fluctuations

A trading day is separated into 15 min intervals. The probability of order book changes shows a significant day pattern. The trend of the average probability for our four basic strategies and the overall measure of limit and volume changes for a latency of 10 ms is depicted in Figure 2. All five lines exhibit the same form, which is only shifted upwards or downwards. As the top line in Figure 2 aggregates all unfavorable order book changes, it shows the highest probabilities. The next two lines represent the passive (buy/sell) strategies and the two last graphs with the lowest probabilities correspond to the active (buy/sell) strategies. Obviously, there are no striking differences among the buy/sell pairs of active or passive strategies as the corresponding best-bid/ask limits are symmetric around the instruments' mid-

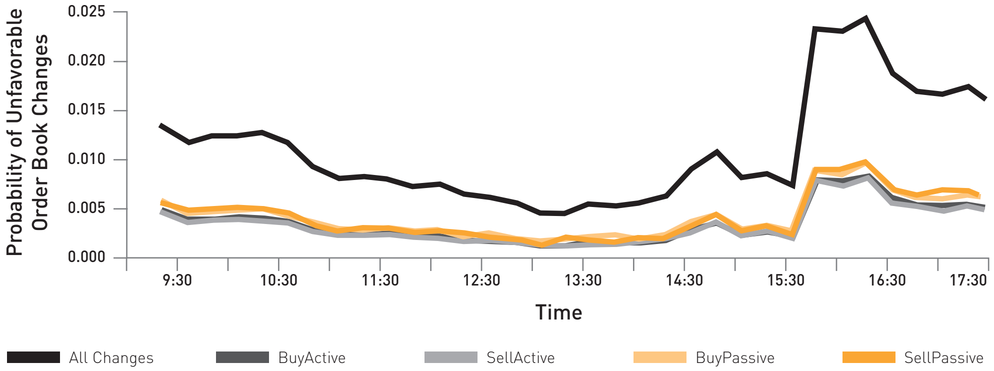

Figure 2: Order book alterations in the course of the trading day for Siemens and 10 ms latency

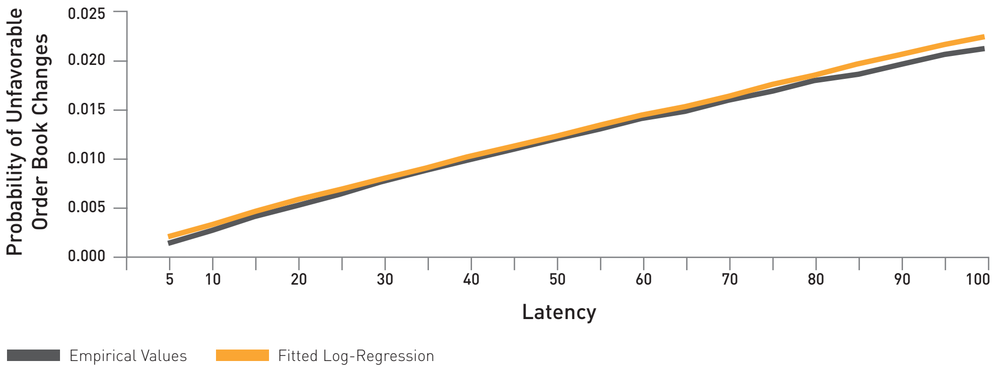

Figure 3: Scaling of probability of order book changes due to latency

point. As passive strategies have a slightly more complex setup, the probability to face unfavorable order book situations is somewhat higher.
In terms of an overall trend, all five graphs share a modified U-shape – as do trading volumes. Thus, in the morning the probability of order book alteration is high and decreases continuously. It reaches its minimum just after the midday-auction, then it increases again. Different from typical volume U-shapes, it falls sharply again at 14:30h, following a strikingly large increase at approximately 15:30h. This is congruent with the opening time of US markets.

Latency Impact

Latency impact is examined for every 15 min interval separately. In every interval, the effect of latency on the probability of unfavorable order book changes typically shows a slightly concave relation. This concave effect on the probability can be found in any interval across all stocks and for all strategies in our sample. The graph in Figure 3 depicts the average increase of possible order book changes for a buy active strategy in E.ON shares. The empiric values can be fitted with a log-linear regression.
From the slope of this regression, we can deduct the following simple rule of thumb: a 1% increase in latency leads to a 0.9% increase in the probability of unfavorable order book changes.

Conclusion

To answer the question whether latency effects require market participants to employ low latency technology, we investigated four fundamental trading strategies. The calculation of directly associated costs is only applicable for active strategies, passive strategies cannot be associated with direct costs without further assumptions regarding the true underlying trading strategy. In this case, we present average latency effects regarding the limit and volume effects market participants face. That way, buy and sell strategies do not exhibit significant deviations.
From the perspective of market participants, the following conclusions can be drawn: for retail investors, who cannot make use of low latency technologies, price effects are negligible. Volume effects also seem irrelevant as retail trade sizes are typically low compared to quoted best bid/ask volumes. For institutional investors, the answer depends on their business model: for algorithmic traders, latency effects yield low increases of error rates (i.e., realizations of possible adverse order book changes within the latency lag). For investors whose business follows long-term profits, these latency effects are less relevant, as they only rely on few infrequent but large trades. The situation is different the more frequently investors trade and the smaller their trading profits for each trade are. For strategies based on extremly small profits associated to each trade – like it is the case for HFT – the negative effects of latency become more relevant.

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Research Report

How Prices can be set to allocate Grid Computing Resources in a Financial Service Institution

GRID COMPUTING IS AN IT CONCEPT TO SHARE COMPUTING RESOURCES AMONG DEPARTMENTS AND USERS THAT REDUCES IT COSTS AND PROVIDES COMPUTING RESOURCES DYNAMICALLY WHEN THEY ARE NEEDED. RESOURCE MARKETS ARE AN EFFECTIVE MECHANISM TO REGULATE THE RESOURCE SHARING, BUT THE MOST OFTEN USED AUCTIONS ARE COMPLEX. WE HAVE DEVELOPED A STEPWISE APPROACH TO HELP FIRMS OFFERING INTERNAL GRID COMPUTING SERVICES TO SET TRANSPARENT BUT EFFECTIVE PAY-PER-USE PRICING SCHEMES AS AN ALTERNATIVE TO AUCTIONS.

Markus Lilienthal

Oliver Hinz

Introduction

Grid computing allows the sharing of resources such as processing power, storage, memory, and other services. By connecting many computing resources (not necessarily only in one data center), the Grid becomes a virtual supercomputer, which allows for a better utilization of otherwise idle resources.

The way how the resources are connected is highly standardized similar to standards for the Internet, whereas the resources themselves (also similar to the Internet) can be arbitrarily diversified. According to Information Systems literature, Grids are supposed to reduce IT costs drastically, thus contributing to Green IT developments, and offer a much more dynamic way to deliver IT resources wherever they are needed (Foster and Kesselman, 2003).

Some see the future of Grid Computing – very similar to the Internet – as one globally connected Grid of millions of computers. However, for some enterprises, in particular in the financial services industry, outsourcing of computing is not an option due to privacy concerns or provision by law. To take advantage of the capabilities of Grids, such enterprises therefore install in-house Grid computing solutions.

For example, Wachovia, the fourth-largest bank in the United States based on total assets, already deployed a Grid thus allowing applications such as parallelized portfolio evaluation to draw computing power from a pool of 10,000 processors spread across numerous cities in the United States and the United Kingdom. The potential benefits are immense, considering that in 2010, North American banks have spent more than $56 billion on IT (Jegher, 2011), cost savings of even a few percent already account for billions of dollars.

Pricing of Grid Resources

Whenever a commodity is shared by many, a mechanism that matches and regulates demand and supply becomes necessary. For more traditional, internal IT resources, probably the most common mechanisms are either to define fixed allowances for all participants, or direct cost allocation, where the departments are charged the average per unit cost.

Both mechanisms are not optimal, even for more traditional IT resources. A market based on real or virtual money could provide the needed flexibility, as the market participants may decide for themselves when they want to consume what type of resource.

Auctions are known as the most effective pricing mechanisms in these settings. Their ability to regulate demand and supply dynamically is extremely high. Therefore, auctions have been extensively considered as a means to allocate Grid resources. However, auctions also have shortcomings. Most of all, auctions are complex and planning reliability is limited. Grid research suggests the use of automated brokers, but complexity and deficits in planning reliability still remain to some extent.

In contrast to all these, the most common pricing schemes we observe in everyday life are posted, non-dynamic tariffs, such as flat fees or pay-per-use prices. The main reason for their appeal and popularity is their simplicity. They are easy to understand and reliable, however, not as efficient as auctions.

With our research, we demonstrate how IT departments can set pay-per-use prices for Grid resources that differentiate users by their needs without the complexity and unreliability of auctions.

Our New Approach of Pricing Computing Resources

We have developed a five-steps approach to determine such pay-per-use pricing schemes for Grid Computing resources (Figure 1). The aim of the scheme is the differentiation of users with respect to their performance needs while complexity is kept low.

Figure 1: Our five-steps approach

We divide users and resources into user segments and resource classes. The aim of the procedure is to obtain a tariff for each user segment (respectively resource class), whereby each user can freely decide which tariff to choose.

The idea behind the segmentation is a strategy of repurposing resources over their lifetime. Throughout the lifetime of a resource, the computational power decreases in relation to the market standard. In a traditional setting with dedicated resources, the resources are either over- or underutilized during most of their lifetime. In a Grid environment, resources can be simply reassigned stepwise to lower classes before they are eventually written off. The system enables all resource consumers to always choose the resource class that fits their requirements.

The five-steps (Figure 1) are as follows.

Step 1: Measuring Willingness-to-Pay
In a first step, we determine the individual willingness-to-pay (WTP) for each consumer at certain speed levels (at least four). WTP is the maximum amount of money the user is willing to pay for the service. Based on these price preferences at discrete points, we can estimate a continuous WTP function.

Step 2: Identifying user segments
After the determination of the WTP the next step is to identify the different user segments. To identify the segments and their number we apply statistical clustering, a method that assigns each respondent to one cluster.

Step 3: Defining resource classes
Resources are classified such that the size of the resource class corresponds to the size of the user segments.

Step 4: Averaging within segments
Having determined the segments, the next step is to compute the WTP by segment as an expected value.

Step 5: Finding tariffs
In the last step, we determine optimal tariffs. There are as many tariffs as user segments or resource classes (one-to-one relationships between tariff, resource class and user segment). Because the consumers may choose freely, the challenge is to determine tariffs such that they choose their supposed tariff. Users always choose the tariff where the difference between WTP and their costs is maximized. This behavior is known as utility maximization. The tariffs should furthermore cover the costs (not necessarily in every segment, but in total).

Empirical Study
As a proof-of-concept, we conducted a survey study in a large European bank that is planning to switch from dedicated servers for single business units to an enterprise Grid. The empirical study follows the five-steps. The sample comprises 21 project leaders and business unit heads with their own budget responsibility.

The CTO office identified about 80 leading employees in Great Britain, Germany and Singapore who held suitable positions with budget responsibilities for IT. Out of this population, 21 business unit managers and project leaders with a budget responsibility for IT resources were willing to participate. The CTO office evaluated this subsample as representative and the results of the study as meaningful.

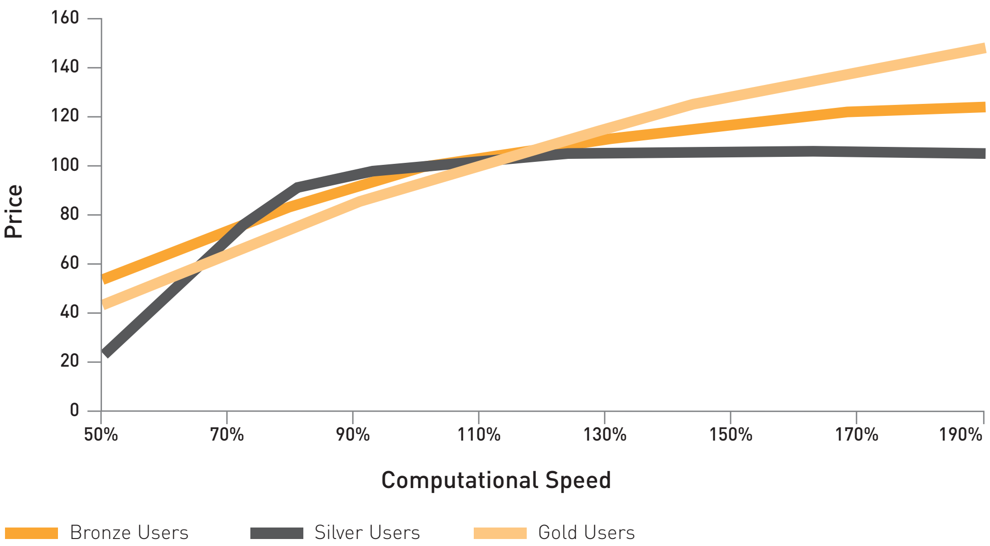

Figure 2: The three user segments in the empirical study

Results
The result of the clustering procedure is displayed in Figure 2. We identified three robust user segments in our empirical study, which we name Gold users, Silver users and Bronze users. Gold users are characterized by a high WTP for high speed resources. Silver users are neither willing to pay for greater computational power nor are they willing to switch to slower resources for a small discount. Bronze users are willing to switch to slower server classes if they receive a sufficient discount, but are also willing to pay moderately higher prices for additional power. We observe that the Gold users are willing to pay much less than double price for double speed, thus provision of those resources would likely be unprofitable from a purely economic point of view and given dedicated computing resources for this group. However, in a Grid system with our pricing scheme, it will be possible to provide access to such resources anyway.

The obtained prices are shown in Figure 3. Based on our survey results, it is possible to assign prices to each resource class such that Gold users prefer Gold resources, Silver users prefer Silver resources and Bronze users prefer Bronze resources.

	Average Power (in class)	WTP Gold Users	WTP Silver Users	WTP Bronze Users	Optimal Pay-per-Use Price
Gold Server	160%	132%	104%	118%	132%
Silver Server	101%	93%	99%	97%	99%
Bronze Server	64%	57%	56%	68%	68%

Figure 3: The suggested tariffs

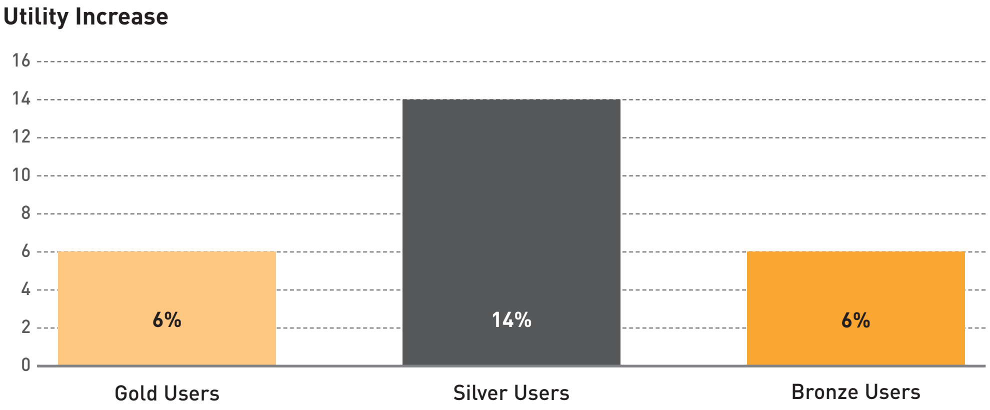

Figure 4: Utility benefit keeping costs fixed

Benefits of the Tariffs

In our study we analyze two benefit scenarios: a cost-neutral scenario and a power-neutral scenario. That means, savings are either used to increase utility while keeping costs fixed, or to reduce costs by delivering the same computational performance as before. The reference scenario for both cases is dedicated resources with direct cost allocation.

We conclude that, by introducing tariffs, the enterprise can either increase the utility by 9% on average (see Figure 4 for details by user segment) while the costs are kept unchanged, or save 7% of the costs without losing any computational power when compared to the benchmark of dedicated resources.

From a managerial perspective, it might also be appealing to apply a mixture of both, such that the cost reduction comes along with an increased performance, which is easier to communicate. Depending on the examined scenario, the entire enterprise will observe either increased utility or reduced costs.

Having only three different price levels, the suggested tariff structure is very simple and easy to understand. It allows the IT department to repurpose hardware continuously: The IT department purchases new servers initially for the Gold segment and later reassigns them to the Silver segment. At the end of the servers' lifetime, the IT department assigns the servers to the Bronze segment.

Conclusion

The Grid technology itself helps to realize untapped cost-saving opportunities that result from idle resources. Moreover, the management of Grids may provide another opportunity, because it will allow enterprises to move from flat fees that cover total costs for dedicated servers to pay-per-use tariffs. Additionally, our method helps IT management to post prices such that incentives are set to move jobs to repurposed, slower servers.

We found that all our participants (internationally dispersed business unit managers and project leaders) are willing to shift jobs to slower servers if incentives in form of lower prices are set accordingly.

However, not all consumers of IT resources are alike. We clearly identified three different segments in our proof-of-concept study. One segment, which we call Gold, had a very high willingness to pay for high-performance computing. The second segment, Silver, derived the most utility from standard servers, whereas the third segment, which we call Bronze, was willing to shift its jobs to slower servers if the IT management was willing to give a discount of about 32% compared to the Silver servers.

The overall costs for the enterprise can be reduced by 7% by repurposing older servers, or the utility to the business units can be increased by 9% at stable costs.

We pinpoint the advantages of our pricing scheme:

- We achieve a fair pricing where all users (business units) can individually decide how to spend their budget,
- Business units can rely on easy to predict expenses,
- The scheme increases utility and/or cuts costs,
- IT investments have a clear life-time cycle and are neither over- nor underutilized.

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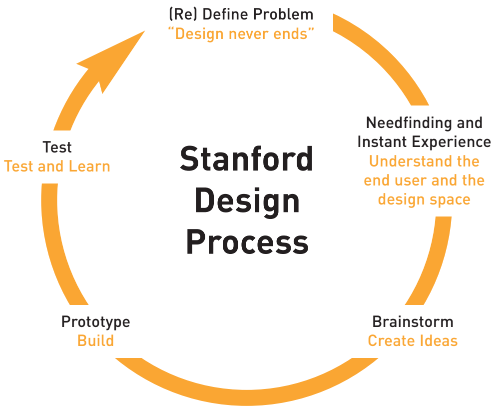
Insideview

Design Thinking in Banking Services: Finding a radical new Innovation

INTERVIEW WITH KATHARINA BERGER, DEUTSCHE BANK AG

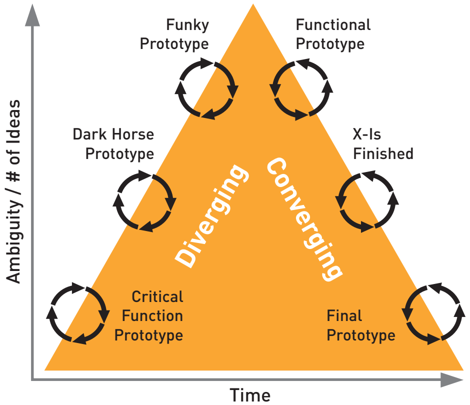
Katharina Berger, Head of Design Thinking@db, Deutsche Bank AG

Can you tell us, what is Design Thinking and why was it implemented in Deutsche Bank?
Innovation is one of the key values of Deutsche Bank. Therefore, we develop and professionalize our innovation management year by year. In this case, we identified Design Thinking as a promising, innovative method that strengthens our focus on our customer needs.



Implementing Design Thinking – based on the ME310 approach of the Stanford University – we install a proven process and a well-tried toolbox of creativity and innovation techniques. This enables us to find radical new solutions and gain customer experience.
Respective prototypes already led to new applications in our branch offices.

What are the key elements – from your point of view – that make the difference to other innovation methods?
Design Thinking is human centered. It requires direct involvement of the potential end user or client. The assigned design teams already start during the Design Space Exploration to interview clients and to observe related situations in banking and in non-banking business areas. To widen the insights, the interdisciplinary teams are working in a spin-off atmosphere, managing their budget and work independently. During the diverging phase, the method calls for a 360° view around the area of investigation to create as many ideas as possible. Each idea is realized as low resolution prototype, which is tested involving again the client directly. Specific milestones ensure focusing on specific perspectives. By solely concentrating on critical functions in the first step, the design teams get strong insights what really drives the customer. Subsequently, during the Darkhorse phase, they create radical ideas. In contrast to our normal project environment, visionary and also unreasonable ideas are supported and transferred into prototypes.



With the Funky Prototype, the design teams compile the first consolidated prototype out of the prior learning. This is the moment where the diverging phase – which creates a lot of ambiguity regarding the outcome – changes into the converging phase, resulting in the final prototype in high resolution.

Do you run all projects in this way nowadays?
Not in any case, but whenever a project starts with a vague problem statement (e.g. "How can we catch the interest of a client visiting the branch office?"), we feel the Design Thinking method is a helpful approach and we already used it several times successfully.

The specific approach of "embedded Design Thinking" allows our internal experts to collaborate with our design teams, consisting of interns from various universities who work for five months on our premises. The teams benefit from the banking knowledge and our internal staff absorbs state of the art creativity techniques, presentation skills and innovation methods to apply it in their daily business.

Where do you see the benefit for Deutsche Bank?
In 2009, we have started with Design Thinking. We have successfully implemented our final prototype in September 2010 in Q110 – Deutsche Bank of the future. It is now on its way to a further rollout. 2011 prototypes are on their way.

At the same time, our annual program allows young talents to join Deutsche Bank for a truly exciting internship. It also strengthens the innovation culture as well as our insights in customer experience.

Thank you for this interesting interview.

Infopool

News

Awards and dissertations

Dipl.-Kfm. Valentin Braun (layer 3) has received his doctoral degree on February 24th, 2011 with his dissertation on "Dynamic Copulas for Finance: An Application to Portfolio Risk Calculation". Congratulations!

Dipl.-Volkswirt Marco Lutat (layer 2) has received his doctoral degree on April 27th, 2011 with his dissertation on "Competition, Fragmentation and Transaction Costs in Securities Trading". Congratulations!

Dipl.-Kfm. Torsten Schaper (layer 2) has received his doctoral degree on May 31st, 2011 with his dissertation on "Managing Post-Trading Infrastructures – Regulatory and IT Challenges". Congratulations!

Team Members

Philipp Blommel and Jenny Pirschel joined the team of layer 3 in April and July 2011, respectively. Jenny recently graduated from Goethe University. Philipp finished his studies at EBS Business School before working for an international consultancy firm. Both will be supervised by Prof. Dr. Andreas Hackethal.

Kai Zimmermann joined the team of layer 2 in May 2011. Kai recently graduated from Karlsruhe Institute of Technology and will be supervised by Prof. Dr. Peter Gomber.

Prof. Dr. Oliver Hinz has been awarded a professorship at the Technical University Darmstadt

Prof. Dr. Oliver Hinz (formerly with layer 3) has been awarded a tenured professorship at the Technical University Darmstadt. Since April 1st, 2011 he heads the Chair of Information Systems / Electronic Markets. Oliver Hinz had been supporting the E-Finance Lab as an Assistant Professor for E-Finance & Electronic Markets since 2009. His work has been published or is forthcoming in journals like Information System Research (ISR), Management Information Systems Quarterly (MISQ), Journal of Management Information Systems (JMIS), Decision Support Systems (DSS), Electronic Markets (EM), Business & Information Systems Engineering (BISE) and in a number of proceedings (e.g. ICIS, ECIS, PACIS). We wish Oliver Hinz all the best in his new role!

Selected E-Finance Lab publications

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RESEARCH PAPER: TOWARDS A FINANCIALLY OPTIMAL DESIGN OF IT SERVICES

Due to the financial crisis, many companies had to radically cut down their IT budgets and are therefore forced to allocate their IT budgets more effectively. Consequently, the development and application of adequate valuation methods for determining the financial impact of IT investments has become increasingly important. The objective of this paper is the formalization and valuation of total cash flows that are associated with different possibilities to realize new functionalities by means of IT services. Therefore, the authors adopt the perspective of a single business unit and develop an optimization approach to determine the optimal functional scope of IT services. This new approach integrates uncertain cash flows resulting from the specification, implementation, and operation of IT services by the business unit itself, as well as uncertain cash inflows resulting from a company internal offset from the reuse of the IT services by other business units. In conclusion, the authors argue that the consideration of the financial consequences of different design possibilities for IT services leads to a better decision with regard to the corresponding risk-adjusted net present value.

Braunwarth, K.S.; Friedl, B.
In: Proceedings of the International Conference on Information Systems (ICIS), 2010.

RESEARCH PAPER: IQ AND STOCK MARKET PARTICIPATION

The authors analyze the connection of investor's intelligence and their stock market participation and find that these are positively related, controlling for wealth, income, age, and other demographic and occupational information. This even holds true if only the more affluent part of the population is considered. Incorporating data on siblings allows establishing that the effect of IQ does not arise from potentially omitted familial and non-familial variables. The authors also show that investors with a higher IQ are more likely to hold mutual funds and larger numbers of stocks.

Grinblatt, M.; Keloharju, M.; Linnainmaa, J.
Forthcoming in: The Journal of Finance, 2011.

Electronic newsletter

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