MYKOLAS ROMERIS UNIVERSITY

FACULTY OF SOCIAL TECHNOLOGIES

INSTITUTE OF DIGITAL TECHNOLOGIES

ŠARŪNAS PIKTURNA

Electronic business management

MEASURING E-BUSINESS VALUE OF USER EXPERIENCE DESIGN

Master Thesis

Supervisor –

Assoc. prof. Tadas Limba

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INTRODUCTION

Relevance of topic. Organizations and their products and services have a user experience (UX) regardless if the organization is consciously managing it (Van Tyne, S., 2010, 30). Companies that are better able to capture the value of UX are more likely to be the ones that invest in the most ground-breaking projects, minimize waste on short-term fixes and abandoned projects and thus ensure a competitive advantage in the market (Hirsch, S., Fraser, J., Beckman, S., 2004, 4). In other words, the strategy for staying ahead of the competition has recently become very closely tied to the creation of significant end user value. According to Harvard Business Review, the primary asset of Instagram that was bought by Facebook for $1 billion, is the best photo sharing UX in the market but not the technology; similarly the patent war between Apple and Samsung is to a large extent related to design patents that define the iOS user experience (Fabricant, R., 2013).

Originality of topic. Traditional technology optimization and time-to market goals of digital products and services are necessary but not sufficient in the context of competitive pressures. Ensuring the success of any digital product has extended beyond technology-based decisions to include planning and assessment of the UX itself (Beauregard, R., Younkin, A., Corriveau, P., Doherty, R., Salskov, E., 2007, 77). The ability to assess UX implies that there is an ability to optimize it based on objective data. Theoretically, a data-driven approach to UX optimization enables companies to create usable, easily adoptable, useful and desirable products that connect with customers‘ needs and wants which is central to the value of every company. Yet measuring the value of great UX to the business is a difficult task. „There is no simple equation that can be applied across a wide range of companies and projects, nor is there a specific number that represents the general value of user experience“ (Hirsch, S., Fraser, J., Beckman, S., 2004, 3). E-businesses regularly need to analyze portfolios of possible web and mobile investments, yet the calculation of financial return on investment made in UX is problematic for several reasons. User experience practitioners sometimes are even not able to convince senior management that there is a connection between user experience and customer value (Turner, W. C., 2011, 53). Thus on one side it is obvious that UX optimization initiatives are important in order to deliver high quality products and services and great UX contributes to ensuring a competitive advantage. At the same time in practice there is noticeable skepticism towards investments in UX, especialy considering expenditures in comparison to investments in advertising, communication and other areas. If there are doubts in seeing the link between customer value and optimized UX, there will also be hesitation in seeing any business value of UX. In order to bridge the gap between theoretical

knowledge of the benefits of good UX and real business value of UX a method to calculate the business value of UX design is required. UX managers need to learn how to collect the right UX data and derive metrics that demonstrate strategic value within the context of their own companies.

Scientific problem. The field of measuring e-business value of UX design is not widely analyzed in academic literature as is the dicspline of UX design itself. In academic literature and e-business practice there is an absence of a comprehensive method for measuring the impact of UX design to the bottom line and demonstrating the business value of UX design.

Object of the research: Measuring the performance and value of user experience design.

Purpose of the study: to determine a model for measuring the e-business value of UX design.

Goals:

1. To analize theoretical aspects of UX assessment
2. To identify the methods of UX design value measurement
3. To identify the principles of UX design value measurement
4. To carry out an expert survey on UX design value measurement
5. On the basis of theoretical analysis and the organized research to propose a model for measuring the e-business value of UX design

Methodology. The study relies on scientific literature deduction (drawing conclusions from the available information), analysis (obtained data analyzed separately), analogy (comparison of data with each other), generalization, comparison methods. Scientific literature analysis and deduction methods were used in order to analyze the theoretical aspects of UX assessment and identify the theoretical methods of UX design value measurement. Generalization method was used to distinguish the principles of UX design value measurement. Comparison and analysis methods where used while analyzing the attributes of user experience, the UX metrics, the data-driven UX design process, the links between e-business models and UX design, the methods of UX design value measurement. Qualitative research method has been applied by interviewing e-business and UX design experts. The research was aimed at finding out e-business experts‘ opinion towards measuring the e-business value of UX design and to learn the methods of UX measurement that are applied in their daily practices. Deduction, analysis, analogy, generalization and comparison methods were used in carrying out the qualitative research. A model for measuring the e-business value of UX design was proposed.

Examination level of topic. The field of UX design is not widely examined in both lithuanian and foreign scientific literature. Some authors even claim that the discipline of UX and

UX design is still not precisely defined nor agreed upon. There is also little analysis on measuring the performance of UX design and even less about measuring the value that UX design creates to businesses or the return on investment of UX design. The concept of UX, its goals and elements were analized by authors like Bevan N. (2006, 2009), Glanzing M. (2012), Pucillo F., Cascini G. (2014), Guo F. (2012), Garrett Jesse J. (2006), Unger R., Chandler C. (2009). Beauregard R., Younkin A., Corriveau P., Doherty R., Salskov E. (2007) analyzed the topic of assessing the quality of UX while measurement of UX itself and the metrics of UX were examined by Tullis T., Albert B. (2013), Rodden K., Hutchinson H., Fu X. (2012), Sage A. (2011), Andrew B. King (2008), Patron M. (2011). E-business analytics, user behavior tracking and partly the value created by UX was analyzed by Croll A., Power S. (2009), Phillips J. (2014), Burby J., Atchison S. (2007), the topic of value measurement of IT was examined by Harris Michael D., Herron David E., Iwanicki S. (2008). The theoretical aspects of measuring the value of e-business were analyzed by Hasan H., Tibbits H. (2000), Martinsons M., Davison R., Tse D. (1999), Hasan H., Tibbits H. (2000), Hoitash R., Kogan A., Srivastava R. P., Varsarhelyi M. (2003). Specifically the topic of measuring the ROI of UX design was analyzed by Hirsch S., Fraser J., Beckman S. (2004) while RosenBerg D. (2004) examined the topic of measuring the ROI of Usability. However, there is no lithuanian academic litterature on this specific topic. Gulevičiūtė G. analyzed e-business qualitative criteria creation and application in her Master‘s work „E-business Qualitative Criteria Creation and Application: Analysis of Global Market“ which partly relate to analyzing the concept of e-business value but the goals of the work are different from the topic discussed in this paper. Other lithuanian authors only touch some aspects of this topic: Bičiūnaitė Ž. discussed the topic of user experience factors in her bachelor‘s work „Research of the intuitiveness of elements in user interface“, Daunoravičius A. dedicated his Master‘s work „Development and analysis of the Web site user interface usability evaluation method“ to developing a method that could help evaluate web site user interface usability, Žylė T. analyzed the assessment and monitoring of the quality of web services in his Master‘s work „Web service audit methodology and prototype“, Rumbauskaitė Inga has chosen a goal of suggesting a usability expert system to choose and evaluate usability features for different types of websites based on users‘ expectations in her Master‘s work „Evaluation Websites design and usability“. So the field of UX design and particularly e-business value of UX design is quite new both in the academic literature and in e-business practice.

Structure. The study is composed of five sections. In the first section the theoretical aspects of UX assessment are analized: the attributes of UX, the goals of UX design and areas of UX assessment are distinguished, different categories of UX metrics are analized and compared, the data-driven UX design process and the relation between UX design and e-business models is presented. The second section examines the theoretical aspects of UX design value measurement,

six methods of UX design value measuremenet are analyzed. The third section introduces the principles of UX design value measurement. In the fourth section the qualitative research is presented. The fifth section is dedicated to the proposed model of e-business value of UX design measurement. At the end of the study conclusions and recommendations are presented. The structure and the links between seperate sections of this study are presented in Figure 1.

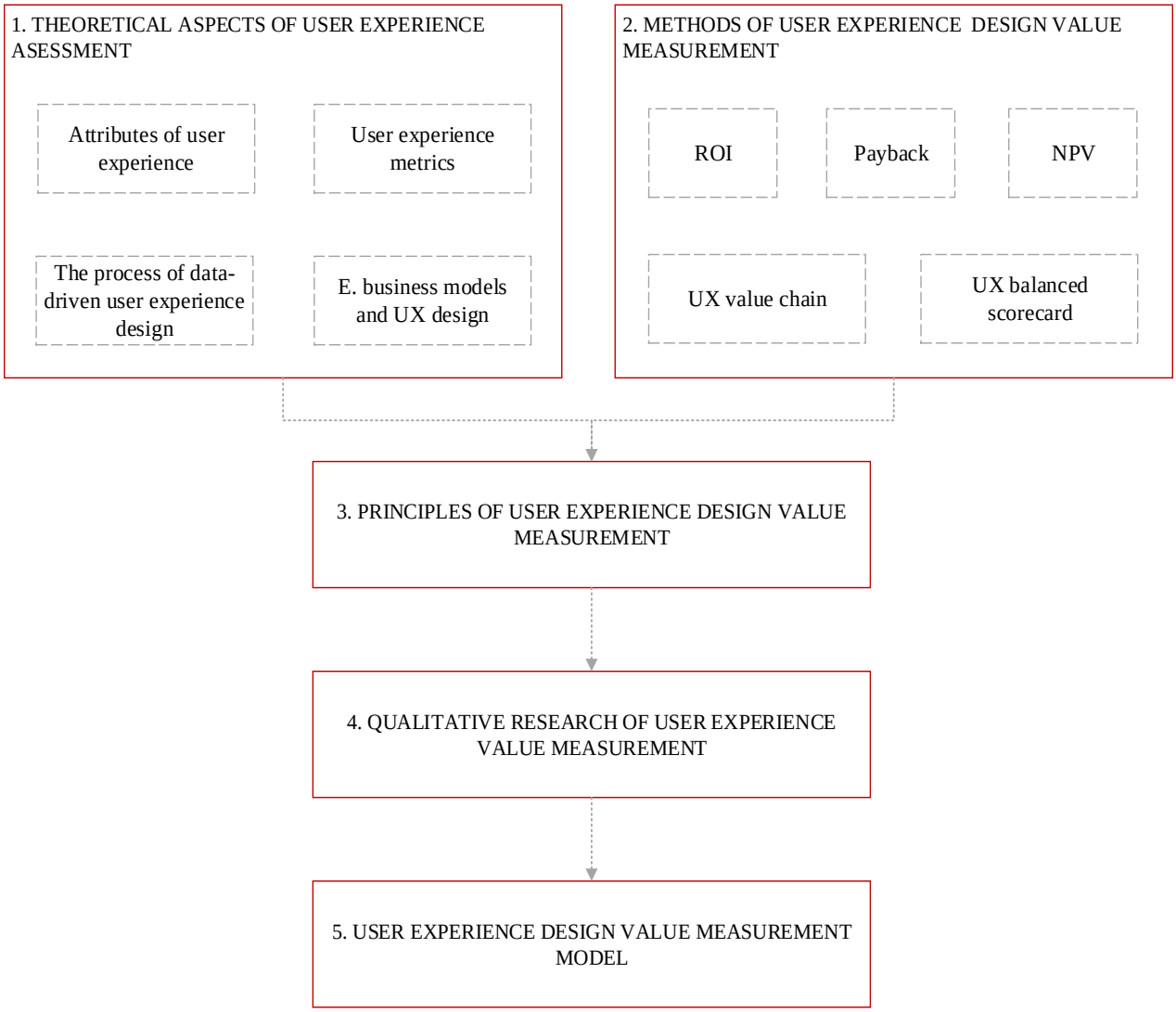

Figure 1. Structure of the study

1. THEORETICAL ASPECTS OF THE ASSESSMENT OF USER EXPERIENCE

Although the term “user experience” (UX) has been used extensively in electronic business in recent years, it has been associated with a wide range of meanings. Commonly in the business environment the term UX is applied in parallel with usability which is most often reffered to the ease of use of a product. On the other hand, UX is also considered as a broad concept that defines the design of products and services. The latter coincides with the point of UX practitioner Van Tyne S., who describes user experience as a term which encompasses all aspects of the end-user’s interaction with an organization, its services, and its products (Van Tyne, S., 2010, 30). It is understood that positive user experience increases adoption, retention, loyalty and, ultimately, revenue while poor user experience is one of the main reasons for customers to reject a product.

The academic community does also not have an agreement on what UX actually is. The concept of UX is quite young (about twenty years old) and evolving rapidly, therefore there is not always agreement about the definition and scope of the concept itself. The explanation and decomposition of UX is often started by first understanding the meaning and the scope of the term of usability. ISO 9241-11 defines usability as „[...] the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in the specific context of use“ (Bevan, N., 2006,533).

Glanzing M. argues that the change of use of technology has contributed to a shift of focus from efficiency to satisfaction which caused the emergence of UX as distinct concept (Glanzing, M., 2012, 236). Pucillo F. et al. state that the term of usability had a limitation as it did not include one aspect of prime relevance: the pleasure of users, which was among the reasons that motivated the emergence of ISO 9241-210, which says that the design addresses the whole user experience (Pucillo, F., Cascini, G., 2014). The definition of user experience in ISO 9241-210 describes it as “a person's perceptions and responses that result from the use or anticipated use of a product, system or service“ (Bevan, N., 2009, 1). Hence the definition of UX goes beyond the traditional instrumental conception of usability that is focused on task efficiency and effectiveness measures. UX includes wider human experience dimensions such as pleasure, fun and other emotions (Beauregard, R., Younkin, A., Corriveau, P., Doherty, R., Salskov, E., 2007, 78).

Both the definitions (Usability and UX in ISO standard) suggest that usability or user experience can be measured during or after use of a product, system or service. Tullis T. et al. argue that UX being observable and measurable is one of three characteristics, defining UX (Tullis , T., Alber, B., 2013, 25). The differences between designing and measuring both of them is that usability puts the focus on effectiveness and efficiency, user comfort and satisfaction while user

experience concerns include "[…] understanding and designing the way in which people interact with the product over time: what they do and why" (Bevan, N., 2009, 1-3).

According to the definition and scope of UX described in the international standard of ergonomics of human-system interaction and with the reference to discussions by different authors, **UX design is related to understanding and designing user behavior**. This coincides with the definition stated by Marcin T. which says that UX design is "a discipline focused on designing the end-to-end experience of a certain product. To design an experience means to plan and act upon a certain set of actions, which should result in a planned change in the behaviour of a target group (when interacting with a product" (Marcin, T. 2013, 19).

Moreover, the goal of UX design can be described as designing the users' interaction with the product with the aim of 1) satisfying user needs and 2) achieving business goals.

Martin T. adds that the result of UX design should always be measurable through metrics describing user behavior because when you are designing an experience, you are in fact planning a change in user behavior (Marcin, T., 2013, 20). Nevertheless, UX design goal setting and value measurement requires more clearly described attributes of the UX itself in the first place.

1.1. The attributes of user experience

Guo F. proposes four distinct attributes of UX that put together constitute an experience that a user undergoes using a product (Guo, F., 2012):

1. **Value**. According to Guo F., users will consider the product valuable if the product's features are designed in such way that they support user needs.
2. **Usability**. Usability refers to the effectiveness and efficiency with which users can complete their tasks using the product. Usability includes things like learnability, content discoverability, findability, readability and the ease with which users can recognize information.
3. **Adobtability**. It relates to obtaining access to a product and answers the question whether people will start using the product.
4. **Desirability**. This aspect describes whether the product is fun and engaging. Desirability relates to emotional appeal and engaging users.

In other words, a product that has a positive user experience is valuable, usable, easily adoptable and desirable. In order to construct a positive user experience which brings value to the business, one must ensure all the four aspects are equally well designed. For example, a product might be valuable because of being rich with needed functionality and information but if the functions are not usable and easily adobtable, the product will be likely to meet early failure

because users will have errors using the product or they will simply not be able to find what they need. Another case of poor user experience could be a desirable product with great design aesthetics and great usability but in case it lacks valuable functionality users will abandon the product early and business will see poor return on investment.

While describing UX, Beauregard R. et al. focus on the emotional aspects of UX and state that there are at least four components of user experience: it consists of perceptions that shape emotions, thoughts and attitudes (Beauregard, R., Younkin, A., Corriveau, P., Doherty, R., Salskov, E., 2007, 78-79). The UX directly influences user behavior that then continues the loop:

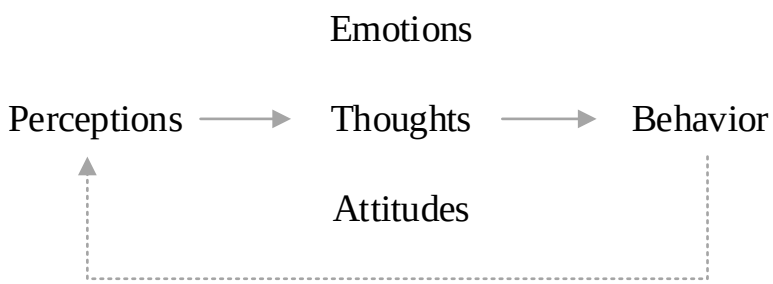

Figure 2. User behavior loop

Source: Beauregard, R., Younkin, A., Corriveau, P., Doherty, R., Salskov, E., 2007, 78.

1. **Perceptions.** From UX design point of view, perceptions are important as it can provide data to drive requirements for development teams which are responsible for designing the interaction with technology.
2. **Emotions.** UX design practitioners must take user emotions into account because they affect purchasing behavior, how much the technology is used, and what users say about their experiences.
3. **Attitudes.** Those are a function of experience with the target and include value judgements, usually experessed as good or bad, helpful or harmful. The attitudes are related to the level user needs are supported.
4. **Thoughts.** This relates to modelling ones‘ experience and planning behavior. Observing user thoughts are important in the process of UX design as products and services must be designed in a way that supports or establishes new patterns of thoughts.
5. **Behaviors.** Actions in response to one‘s experience that include both verbal and physical behavior. By observing the behaviors after the use of a product and a service, companies are able to monitor the level of user adoption and retention.

Beauregard R. et al. argues that targeting end-user value propositions during UX design projects requires a holistic understanding of how people interact with technology (Beauregard, R., Younkin, A., Corriveau, P., Doherty, R., Salskov, E., 2007, 78). This in turn presents new challenges and opportunities in setting UX goals and implementing UX design projects. Ease of use and other attributes of good usability have become a basic expectation, therefore companies have to differentiate on other aspects of UX like good emotion.

What is important in the latter describtion of UX attributes is describing user behavior as a consequence of perceptions, emotions, attitudes, thoughts. This way the UX design targets the UX attributes to facilitate user behavior in a way it ensures user interest. User interest is fundamental for her to come back or even spread the word about a product or service.

Garret Jesse J. presents five user experience elements which should be adressed in the process of product development: according to Garret Jesse J., consistently implemented these elements ensure developed products meet business goals and customer needs as well as create positive attitudes and customer loyalty (Garrett, J. J., 2006, 36-39):

1. **Strategy** should be understood as a foundation of every user experience. The strategy must balance the business‘s objectives for the product with the needs and expectations of the product‘s users. Needs include the concrete goals and objectives users have for their interaction with the product, as well as emotional characteristics of the experience they desire. The business and user‘s goals determine how success of the product would be measured and therefore later help to make smart UX design choices that would support those goals and needs.
2. **Scope** is the entire set of features the product has including both the functional and informational aspects of the product, i.e. the functional specifications and content requirements. In other words scope is similar to product conception which has the goal of identifying the features that align with user needs and expectations. No matter how effectively the features of the product are designed in later product development stages, if they aren‘t the right features – probability of product success is minimal.
3. **Structure,** as told by Garret Jesse J., is where the user experience starts to take shape. The objective of the structure phase is to construct the information architecture and interaction design elements that support the natural way a user behaves about achieving a goal. The disciplines of information architecture and interaction design requires deep understanding of the psychology of the user. If done right the structure of the product should mirror user‘s expectations and the ways they understand and use information.
4. **Skeleton** relates to understanding how the experience will flow for the user and what form the experience will take. The stage must accomplish the goal to effectively

communicate to the user the choices available to them and to help users access the content of his or her choice. These UX design choices can make the difference between confusing experience and a rewarding one that drives repeat visits and customer loyalty.

5. **Surface** relates to the sensory design choices. The UX design decisions made in this stage must reinforce and support all the choices made about the other elements of user experience and UX design in this stage should not be made on purely aesthetic grounds. Sensory design can have a powerful effect on customer loyalty. The emotional dimension to experience can, in many cases, persuade the user of the value of a product.

As stated before, in order to be able to measure the business value of UX, one first needs to assess the UX itself based on objective data and not subjective estimations. The before mentioned three versions of different attributes of UX enable to determine the areas of UX assessment (see Table 1):

1. Level with which user needs are supported
2. Effectiveness and efficiency (with which users can complete their tasks) measures
3. Emotional appeal and engagement measures
4. Planned and formed user behavior

Table 1. The elements of UX and the areas of UX assessment

	Guo F.	Beauregard R. et al.	Garret Jesse J.
Supporting user needs / requirements for development	1. Value	1. Perceptions, 2. Attitudes	1. Strategy (also puts focus on business objectives), 2. Scope
Effectiveness and efficiency of user tasks	2. Usability		3. Structure, 4. Skeleton
Emotional appeal and engagement	4. Desirablity	2. Emotions	1. Strategy, 5. Surface
User adoption and retention	3. Adoptability	5. Behaviors	4. Skeleton, 5. Surface
Planning and forming user behavior		4. Thoughts, 5. Behaviors	2. Scope, 3. Structure

To summerize the theoretical background, the first three areas of UX should be optimized by UX design initiatives in order to stimulate the fourth area of UX – user adoption and retention – and form the fifth area of UX – the needed user behavior.

In order to be able to estimate the value of UX design to the business, there is a need to see the big picture in the first place – businesses that are eager to value the impact of UX need to have an overall UX performance and value measurement system. There are at least three aspects of UX design measurement that need to be discussed in more detail:

1. It is vital to perceice how UX metrics enable to gain new insights and reveal patterns of user behavior that would else be difficult or even impossible to see without analytics data.
2. A process which would ensure decision making and acting upon assembled UX data should be specified.
3. UX design goal dependence on e-business models that businesses are employing.

1.2. User experience metrics

For UX design to be valuable to the business, UX must be precisely measured ant understood. These days visitors make a decision about leaving or remaining on site within seconds of first interaction with it therefore modern sites and applications must not only give users what they need, but also exceed their expectations by delighting and surprising them (Croll, A., 2009, 149). The before outlined areas of UX measurement should theoretically enable to achieve such level of experience as it should help to ensure customer needs and wants are met as well as overall usability and performance is optimized and emotional engagement is ensured.

The UX design intends the websites and applications to be used in a certain way. As stated by Unger R. et al., User experience design is "[...the creation and synchronization of the elements that affect users‘ experience with a particular company, with the intent of influencing their perceptions and behavior" (Unger, R., Chandler, C., 2009, 3). Croll A. et al. specify, that UX designers base their decisions on many factors and all of them lead to a hypothesis – „an educated guess how visitors will interact – that later needs to be tested and verified" (Croll, A., 2009, 149). The author also argues that UX metrics serve as a measure of how easily and delightfully the users can interact (Croll, A., 2009, 149). In addition to that UX metrics reveal information about the interaction between the user and the product – some aspects of efficiency, effectiveness or satisfaction – UX metrics differ from other metrics in that they also measure something about people and their behavior or attitudes (Tullis, T., Albert, B., 2013, 27).

As stated by Tullis T. et al., with UX metrics, you might for example "[...]determine that a simple change in a data input field on an internal website could reduce data entry errors by 75%, reduce the time required to complete the customer service task, increase the number of transactions processed each day, reduce the backlog in customer orders, cut the delay in customer shipments, and increase both customer satisfaction and customer orders, resulting in an overall rise in revenue for the company" (Tullis, T., Albert, B., 2013, 29).

Conterintuitive sites put off users, while the ones with good UX steer visitors towards desired goals. The process of UX design requires UX designers to specify user goals and scenarios of how users will interact with the site or application. The user goals in turn, depend on business goals. This indicates what UX metrics should be used, what user behavior should be tracked.

Tullis T. et al. state every type of user behavior can be measured in some way and distinguishes two main groups of UX metrics: performance metrics and self-reported metrics (Tullis, T., Albert, B., 2013, 151-152).:

- **Performance metrics** are said to be calculated on specific user behaviors and also on the use of scenarios and tasks. Without tasks or scenarios those metrics would not be possible because success could not be measured if the user of the product or service was only browsing or playing aimlessly. Performance metrics usually let indicate overall usability and predict potential cost savings or increases in revenue. Another important aspect is that this category of metrics indicate the effectiveness but do not explain the causes of problems. It is always based on actual user behavior rather than what they say. Performance metrics is a category that encompasses several other metrics like task success (measures wether users are able to complete tasks), time on task (how quickly users can perform tasks), errors (number of mistakes users make while attempting to complete a task), effieciency (number of steps or actions required to complete a task), learnability (how efficiency changes over time) and other.
- **Self-reported** metrics is a way to gain information about users' perception of the product or service and their interaction with it. The data may also tell something about how users feel about the product or service. Unlike performance metrics, this category represents completely subjective data but at times it may be more important than performance because even if a system lags in usability but the users are happy and willing to interact, everything else is of secondary importance. The data for self-reported metrics are usually captured in a UX study with some type of rating scales like Likert scale (statement to which respondents rate their level of agreement) or Semantic differential scales (technique involves presenting pairs of opposite adjectives to which users assign a value of agreement).

The latter two categories of metrics encompass all the above mentioned areas of UX assessment. According to the description of self-reported metrics, those would be suitable in assessing the level of how user needs are supported as well as emotional appeal and user engagement. Whereas the category of performance metrics is a means in assessing the effectiveness and efficiency of a website or aplication as well as engagement and forming user behavior.

A more accurate view on online business metrics is presented by Croll A. et al. who state that regardless of the type of business one is in, there are many things that should be tracked mandatory: "[...]the actions visitors took, the experiences they had, how well they were able to use the site, what they hoped to accomplish, and most importantly, whether your business benefited in some way from their visit" (Croll, A., 2009, 15). Some of the metrics described by Croll A. et al. directly relate to the field of UX (Croll, A., 2009, 28-29):

- **Conversion** is a category of metrics that evaluates the percentage of visitors that complete a specific goal. This metric is considered to be the most important metric of all by the authors as visits to the site do not mean anything if visitors do not accomplish the things important to the business. Conversion enables to track how visitors become contributors, buyers or users and UX design may very well contribute to achieving that goal.
- **Visitor Motivation** refers to above mentioned category of metrics that are named self-reported metrics by Tullis T. et al.
- **Findability and Search Effectivesness** metrics indicate if users are able to find what they are after. The area of concern is the number of searches that ended with another search, with a return to a homepage, abandoment. The analysis of most popular search keywords is also a must.
- **Usability metrics** fall into the group of performance metrics listed by Tullis T. et al. and answer the question whether users could understant how to do something the way it was intended.
- **User Productivity** metrics are also within the group performance metrics and unlike Usability metrics they investigate if users could accomplish their goals quickly and without errors.

Talking about key performance indicators of user experience, Rodden K. et al. argues that it is a need to use direct user experience metrics in order to evaluate the impact of user interface changes as oposed to such indirect UX metrics as system latency, page views and other "basic" metrics (Rodden, K., 2010, 2). Thus for both measuring user experience quality and providing actionable data for user experience practitioners, a framework of categories of metrics was

proposed called the HEART which encompass user hapiness, engagement, adoption, retention and task success (Rodden, K., 2010, 2):

- **Hapiness** includes metrics that are attitudinal and relate to subjective aspects of user experience like satisfaction, visual appeal, likelihood to recommend and perceived ease of use.
- **Engagement** refers to behavioral aspects such as frequency, intensity or depth of interaction over some period of time. These include such metrics as visits per user per week or items uploaded per user per day.
- **Adoption and Retention** metrics which are used to count the number of unique users in a time period in order to distinguish new users from existing ones. **Adoption** metrics track how many new users start using a product during a given time period while **Retention** metrics track how many of the users from a given time period are still present in some later time period. The term „using" depends on the nature and goals of a product or business.
- **Task success** includes traditional behavioral metrics of UX such as efficiency, effectiveness, error rate.

The heart framework could be criticized because of relating all the above mentioned metric categories to UX metrics. UX metrics should only track areas that are directly related and depended on the actions of UX design. As an example the author names the number of visits per user in the engagement category. But this metric largely depends on marketing but not the UX design. While e. marketing as a business unit covers customer acquisition, conversion and customer retention, the goals of UX design directly relate to one of them – conversion optimization. The group of engagement metrics could be the object of UX design if it assessed another aspect of user engagement – for example, how often do users use one or another functionality or content element. Similarly to engagement, the increased or decreased adoption and retention should be seen as the impact of UX design but not an outcome. The reason behind this is that user adoption and retention both depend on many factors and actions a company undertakes in order to increase customer loyalty or interest in its products or services.

Rodden K. et al. intoroduces an important category of indirect UX metrics (Rodden, K., Hutchinson, H., Fu, X. 2010). If UX metrics were divided into direct and indirect ones, the first group should include those related to efficiency, effectiveness, customer satisfaction and user behavior that creates value to the business. The indirect metrics that measure loyalty should be seen as generic e-business metrics and UX design may have only indirect incluence towards them.

Therefore indirect UX metrics will not be included in measuring the business value of UX later in this thesis.

In Table 2 the before mentioned groups of UX metrics are categorized according to UX areas they are aimed at assessing. As shown in table 2, different authors assign different names to the same or similar categories of metrics.

Table 2. Areas of UX assessment and UX metrics

	Tullis T. et al.	**Croll A. et al.**	**Rodden K. et al.**
Supporting user needs / requirements for development	Self-reported metrics;	Visitor motivation	
Effectiveness and efficiency of user tasks	Performance metrics	Findability and search effectiveness; Usability metrics; User productivity metrics	Task success
Emotional appeal and engagement	Self-reported metrics;	Visitor motivation	Hapiness; Engagement
User adoption and retention		Loyalty	Adoption and retention
Planning and forming user behavior	**Performance metrics**	**Conversion**	

However, UX metrics could also be decomposed into two large groups according to which of two areas of UX they are assessing (see Table 3). The first group would be designed to measure the usability and ensure, for example, that the digital product would not have elementary search, navigation and other errors (metrics related to usability optimization). The second group could be designed to measure the success in modeling the attitudes, provisions and behavior of users (metrics related to forming the attitudes and behavior of users). The latter group is related to stimulating user behavior and conversion rate optimization which is done in order to make users click, navigate, watch or read elements that business gains value from.

Table 3. Areas of UX assessment and categories of UX metrics

Metrics related to Usability optimization	Metrics related to forming the attitudes and behavior of users
Performance metrics category:	Self-reported metrics category:
Findability and search effectiveness;	Visitor motivation;
Usability metrics;	Hapiness;
User productivity metrics;	Engagement metrics category;
Task success.	Conversion rate metrics category.

Talking about the metrics in general, many authors, including Phillips J., state that analytics enable decision making based on facts and measuring the performance of digital business channels and products (Phillips, J., 2014, 28). Sage A. agrees to this position proposing that „good metrics are a must for customer experience improvement“ (Sage, A., 2011, 1). On the other hand, the technology and tools may help counting and measuring all sorts of digital metrics, but they do not by themsselves provide for any actionability or impact directly delivering business value. UX metrics are not an end in themselves; contrarily, UX metrics are a tool that helps companies reach informed decisions: metrics add structure to the design and evaluation process and provide information to senior management (Tullis, T., Albert, B., 2013, 28). “While the technology and tools that support analysis are critical and necessary, they are insufficient by themselves in creating business value” (Phillips, J., 2014, 27). No matter how user-centered a metric is, it is unlikely to be useful in practice unless it explicitly relates to a goal, and can be used to track progress towards that goal (Rodden, K., Hutchinson, H., Fu, X., 2010, 3).

So it is clear that UX metrics do not on their own create value to the business. The value is only seen if metrics will be tied to business goals. In order to consistently pass through the business goals to scenarios of user behavior and metrics to assess it there is a need of a structured process with clear stages that have clear goals.

1.3. The process of data-driven user experience design

The value from analytics is created by analyzing the UX metrics data within established and sustained business processes to provide insights and by acting upon them. Creating and maintaining a successful digital experience that drives business results requires an ongoing design optimization: “a data-driven process that includes measuring the outcome and impact of UX

design, as well as codifying key insight, design and technology acitivities info a repeatable set of tasks that firms can use to create and maintain their website, mobile ar tabletsite, application, or any other digital experience“ (Forrester Research, 2012, 3).

In the market of e-business there is a whidespread practice of developing digital products using iterative methods. Continual learning, early delivery to market, early user feedback collection, regular testing and corrections according to that feedback is specified in such product development methodologies as Lean Startup (Ries, E, 2011), Lean UX (Gothelf, J., Seiden, J., 2013) and User-centered design (Courage, C., Bater, K., 2005, 5). As stated by Courage C. et al., it is recommended to design, modify and test the product repeatedly: “[...] you continue to iterate and finetune with each cycle until you get it right” (Courage, C., Bater, K., 2005, 5).

As seen in the analysis of UX metrics, one of the most important metric related to formating and measuring user behavior is the conversion rate metric which demonstrates what percentage of users that use a product have performed an action that is of value to the business or what per cent of users achieved a goal that is important to the business. In practice, using iterative optimization methods, conversion rate metrics are being optimized in several stages. After the business requirements are analyzed and user behavior goals are set, the UX design is implemented. The UX design is than analyzed in analytical systems and according to results the decisions are made related to further UX design actions. Such process is named conversion rate optimization (CRO). “Conversion rate optimization (CRO) is the art and science of persuading your site visitors to take actions that benefit you, by making a purchase, offering a donation, or committing to some positive future action” (King, A., B., 2008, 111). Andrew B. King states that CRO, while formating user behavior, helps businesses to achieve the following goals (King, A., B., 2008, 111-112):

1. Increase in sales, revenues, profits
2. Generation of more leads
3. Increasing the user base
4. Reduce customer acquisition costs
5. Increase page views for advertising
6. Increase user engagement

The goal of CTO is optimization of UX design with the aim that every user visit would bring value to the business. It is recommended to firstly invest money to conversion rate optimization and only then (if conversion rate metrics are decent) invest into marketing with the aim of increasing user traffic. But usually in practice the actions are undertaken vice versa: most website owners focus on getting more traffic to boost online sales ((King, A., B., 2008, 112).

However, the importance of CTO in digital product management is indisputable. As stated by Patron M., in order to improve CR metrics, businesses need to have a precisely defined, iterative

optimization process: "[...]a structured approach to improving conversion needs to be a continuous improvement process; an iterative cycle of measurement, analysis, testing and optimizatio." (Patron, M., 2011, 3) Patron M. suggests a four stage data-driven design process. It consists of four stages which each having its own goals. Only after implementing one stage one has the right to proceed to the next stage. Every business and every product is unique but such process draws a clear direction of how to optimize user behavior (Patron, M., 2011, 3-11):

1. The first step is aimed at setting business goals and KPIs. It is recommended to write down user needs and expectations as precisely as possible. Based on this information, user behavior goals should be set.
2. During the second stage the current level of the product user experience should be valued. This is done with the aim to capture any usability defects, content errors that would interfer the users to achieve goals that were raised in the first step.
3. The third step requires product testing with the users. Different design versions are being tested real-time and user interactions with the product are being observed. After observing which design solution does work and does not work, the final stage is implemented.
4. The final stage has a goal of product optimization with UX design solutions. When the business goals and user behavior goals are clear, when current usability level is assessed and several design version are tested, the solutions that were successful are being adapted to the whole product. After the fourth stage is done, the cycle starts all over by analizing differences in KPI. No matter what the result is, the circle is revolved repeatidly. If the goals were not achieved, the analysis would be conducted one more time and other design solutions would be tested.

Though this process is presented as suitable and necessary in optimizing CR metric, the process is universal and should be suitable for the optimization of all UX metrics. The same steps that are implemented to improve CR metrics should be used when aiming, for example, to minimize the number of errors users make (metrics related to usability optimization). This principle is supported by another methodology named ZAAZ.

The ZAAZ methodology is closely related to the before mentioned CTO as it consist of a five step cyclical process as shown in Figure 3 (Burby, J., Atchison, S., 2007, 65-68):

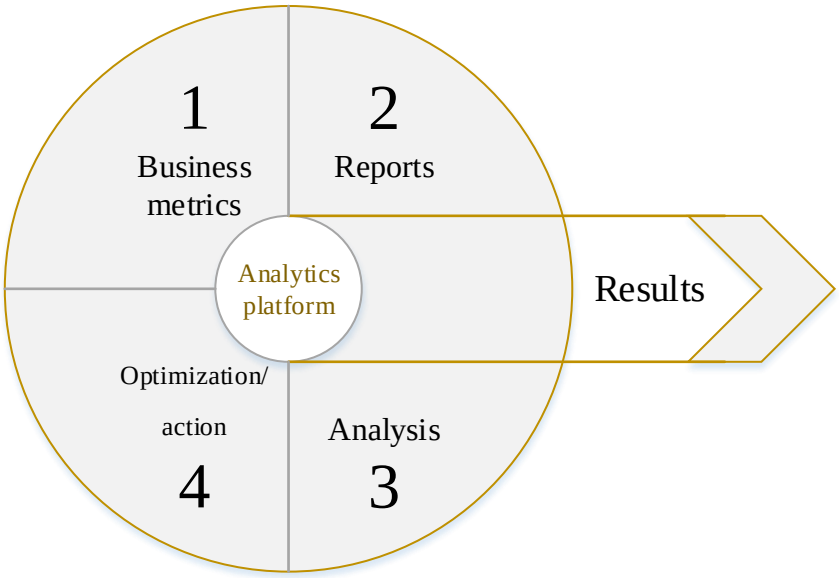

Figure 3. ZAAZ methodology

Source: Burby, J., Atchison, S., 2007, 65

1. **Defining Business Metrics (KPIs).** The goals should be defined well beyond the website or application. In order to form business metrics one must look at online presence in the context of overall business strategy because that should be the foundation of everything done with analytics data. The business strategy should also be the foundation of determining how one or another user behavior relates to business goals: this may include such examples as user paths that businesses want them to take, products businesses want them to purchase online or content that businesses want users to explore more deeply.
2. **Reports.** The second step is intended to collect the KPIs and contributing metrics. Reports demonstrate what users are acutally doing on the website or application.
3. **Analysis.** This step is required in order to understand the reasons behind particular user behavior. Alongside collected data it also includes analysis of factors that drive performance.
4. **Optimization and action.** Based on the findings and conclusions actions like changing the design, information architecture, structure and other product or service related action should be taken.
5. **Results.** The final step relates to checking the metrics after optimization in order to measure the impact of UX design projects. As with other before mentioned methodologies ZAAZ emphasizes that this process does not begin and end with a single application. Once the five steps are implemented, the process starts all over by looking at business metrics.

User behavior goals depend on the specifics of particular business. However, there are some groups of metrics that are suitable and necessary for specific e-business models. In other words, an e-business model indicates what user behavior is most important to the business and thus what UX metrics should be used for different types of e-businesses.

1.4. Online business models and UX design

As stated before, the first step in making metrics work is tying those metrics to business goals. Rodden K. et al. proposes a process called "Goals-Signals-Metrics" that help linking business goals to UX metrics (Rodden, K., Hutchinson, H., Fu, X., 2010, 3-4). The first step recommends identifying the goals of the product or feature in terms of user experience, considering the tasks users need to accomplish. The next step requires identifying signals – the actions needed in order to accomplish the tasks and the actions that would indicate the user goals has been met. Thirdly, signals need to be translated into specific metrics, suitable for tracking over time.

Basically what this process does is facilitation of the transition from business goals to UX metrics. But the question of how the business goals should be linked to user behavior remains unanswered.

In order to answer that question one needs to look at the goals and needs of different online businesses. Depending on various business models and revenue streams these businesses may have entirely different expectations for user behavior and thus diverse requirements for UX design activities and UX design metrics.

Every online business tracks metrics expressed as key performance indicators (KPIs) to measure how well it is doing. While there are some universally important metrics each business has its own definition of success: for a search engine it‘s good when people leave – as long as they go to the right places when they do: the sooner someone leaves the search engine for a paying advertiser‘s site, the better, because that visitor has found what she was looking for (Croll, A., Power, S., 2009, 7). "By contrast, the e-commerce site wants people to arrive (preferably on their own, without clicking on an ad the e-commerce site will have to pay for) and to stay for as long as it takes them to fill their shopping carts with things beyond what they originally intended" (Croll, A., Power, S., 2009, 7). These two businesses not only track different metrics. They are also in need of different user behavior: one business is trying to make visitors stay while the other benefits from people leaving.

It is common for a business to fall into different online business model categories at a time but generally there are four main online business models (Croll, A., Power, S., 2009, 8-13):

1. **Media property.**

   These businesses create value to the user by offering valuable content that they would not find elsewhere. Revenue is earned through advertising, affiliate programs, sponshorship. The primary goal of a media property is the volume of users as well as numbers of returning visitors because these metrics are prerequisite in order to attract advertisers. Generally said revenue is generated by users‘ clicks on advertisements.

   UX design in Media property e-business model. Thus from UX design perspective the user behavior goal of a media site is maxizing the number of users that click on advertisements. UX design goals are related to creating a ballance between the visibility of content and the visibility of advertisements. UX design is also responsible for ensuring the findability of content and search effectiveness.

2. **Transactional business.**

   These businesses create value to the user by offering valuable services online or by selling digital or physical goods on an e-commerce platform. Whatever the specifics, this type of business generates revenue from outcomes because it is "[...] directly driven by the percentage of visitors who complete a particular process" (Croll, A., Power, S., 2009, 605). The primary goal of a transactional business is maximing the number of visitors who make a purchase and maximing the shopping cart size. Alongside this primary goal it may also be vitally important to maximize the numbers of transactions related to enrollment or lead generation. Though transactional businesses are concerned about the volume of visitors as well as media properties, these numbers will have no value if visitors do not complete any type of transactions.

   UX design in Transactional business e-business model. From UX design perspective the user behavior goal is maximing the conversion rate – the per cent of users that achieve a specific goal: be it signing up for email, asking sales to contact them, putting goods into online shopping cart or other. UX design goals are related to creating an interface that would lead the user through **the process** from the first touchpoint with the business to the last step that would end by achieving a goal that brings value to the business and to the user herself. This is achieved through decent site or application structure, navigation design, appropriately chosen call-to-action elements, search effectiveness, especially putting focus on the analysis of search keywords that would lead to a needed transaction.

3. **Collaboration platform.**

   On the contrary to media properties and transactional businesses, collaboration platforms are largely dependent on the content created by the visitors themselves. As

well as media properties collaboration platforms earn revenue from advertising so two of the main business goals are the same – the volume of users and numbers of returning visitors. The big difference is that media properties create quality content themselves while collaboration platforms instead of the creation of content are delivering an engaging, exciting, easy means for users to create and share content themselves. Therefore this type of business not only looks after opportunities to grow traffic. Its primary goal is to grow a user community that is willing to collaborate: create content and share, comment or rank the content created by others, build social networks. On the other hand the goal is also to minimize the ammount of bad content that is disengaging.

UX design in Collaboration platform e-business model. From UX design perspective there is a dual user behavior goal: to maximize user engagement and maximize the number of users that click on advertisements. UX design goals are related to creating an interface that would boost interest in exploring the content created by others as well as develop easy, usable or even gamified elements that would inspire creativity and the willingness to grow social networks.

4. **Software-as-a-service (SaaS) application.**

This type of business creates value by offering online software that would benefit organization in their daily proccesses and operations. Moreover, online software platforms are being created with an attempt to offer more convenient services than their desktop alternatives by introducing features that would be impossible while working offline like online collaboration or real-time data sharing. SaaS applications generate revenue from user subscriptions: be it a universal entry-level fee for all the users or premium subcription for those willing to receive premium functionality or content. Irrespective of pricing models, the primary goal of SaaS companies is maximing the number of paid users.

UX design in Software-as-a-service (SaaS) application e-business model. From UX design perspective the primary user behavior goal is maximizing the conversion rate – the visitors to become users, the freerium users to become paid users, the paid users who are using the basic version of services to become premium users. It is of big importance to convince subscribers to renew their subscriptions. The third user behavior goal is related to user engagement. And user engagement is closely related to UX design goals of creating great levels of performance. As SaaS platforms a productivity tools in the first place, the primary goal of UX design is related to developing an interface that would enable users to complete their daily tasks using

software faster and easier compared to working without the software. If a decent performance level was achieved, the user engagement level would most likely grow. There more user engagement, the more chances to see growing numbers of paid users.

Hence, the presented e-business models demonstrate how different primary business goals determine distinct user behavior requirements. That is important because the objectives of UX design depend on the goals of user behavior. This in turn suggest what UX design metrics are essential in measuring the success of UX design and the value it creates for the business. The table 4 presents a generalized view on the revenue streams of different e-business models, the goals of user behavior and primary UX design metrics. Of course, this generalization shows a theoretical view and in practice the goals and metrics strongly depend on the specifics of different businesses. But this gives a hint on how UX design goals and metrics are to be connected to strategic business objectives.

Table 4. E-business models, user behavior goals and UX metrics

Business model	**Media property**	**Transactional business**	**Collaboration platform**	**SaaS application**
Revenue stream	Advertising	E-commerce	Advertising	Subscription
User behavior goals	Maximize the number of users that click on advertisements	**Primary goals:** Maximizing the number of visitors who make a purchase; Maximizing shopping cart size. **Secondary goal:** Maximizing the number of transactions realted to enrollment and lead generation	**Primary goal:** Maximizing user engagement (specific engagement metrics depend on the business); **Secondary goal:** Maximize the number of users that click on advertisements;	**Primary goal:** Maximizing the number of visitors who make a purchase (become subscribers); **Secondary goals:** Maximizing user engagement (specific engagement metrics depend on the business); Maximing user performance (specific performance metrics depend on the software)
Primary UX metrics	Conversion rate (click-through).	Conversion rate.	Engagement; Conversion rate (click-through).	Convertion rate (subscriptions); Engagement; Performance.

This chapter described the attributes of UX and connected the assessment areas of UX with those attributes. Furthermore the metrics of UX were presented and they were categorized according to UX assesment areas. In order to demonstrate how UX metrics should be applied and

how UX metrics could create value to the business the process of data-driven UX design was described. It was stated that UX design is related to forming user behavior as all UX design projects should have a goal of replacing or adjusting existing user behavior. The goals of user behavior depend on business goals which often times result from a business model a company has chosen. Therefore the fundamental online business models were presented as well as their primary business goals and UX related user behavior goals. All of this enables to understand the specifics of measuring the outcomes of UX design projects. As presented in the next chapter, measuring UX design outcomes is closely related to measuring the impact UX design has on businesses.

2. METHODS OF USER EXPERIENCE DESIGN VALUE MEASUREMENT

In order to make sound business decisions, alongside measuring the outcome of UX design projects, one also needs to measure the impact UX design projects has on businesses. In other words what is the business value that UX design creates.

As stated by the Center for Business Practices (Center for Business Practices, 2005, 2), measuring project value help companies achieve one or more of the following goals:

1. To identify the business impact of implementing project initiatives
2. To compare costs to benefits of project initiatives
3. To determine if a project initiative is accomplishing its objectives

In order to calculate the business value of UX design one must be able to assess the desired value before the project and to calculate the actual value after the project is finished. In other words, UX should be assessed against a specific target, using a specific metric and method or tool. Measuring value aims at demonstrating that decisions made to implement change has added value to the organisation, i.e. value measures provide information on the performance of the organisation rather then performance of a project (Center for Business Practices, 2005, 2).

Phillips J. states that analytics systems should be created with an attempt to demonstrate economic value, i.e. all analytical work should be focused on answering business questions and solving business challenges and issues: business outcomes of analytical work must be tied to financial business metrics, such as cost, revenue, margin, profit, and earnings (Phillips, J., 2014, 39-40, 75-76). In other words, the best use of analytics is tying back the digital behavior, events, and transactions to financial metrics, such as cost reduction, increased efficiency, revenue, profitability.

Roughly speaking, from the business side UX will be considered valuable if return on investment to UX design projects is positive. In other words – if benefits exceed invested resources. As stated by Tullis T. et al. (Tullis, T., Albert, B., 2013, 26), Phillips J. (Phillips, J., 2014, 90) and Burby J. et al. (Burby, J., Atchison, S., 2007, 95), business investments including investments in UX design should be made on the premise that the end result of a project would achieve one of the following goals:

1. to increase income or
2. to decrease the costs of delivering a product or a service.

Therefore business value of UX design should be described as the UX design project outcomes of decreased costs and/or increased income.

However business value is reffered to a term that includes all forms of value that determine the health and well-being of the firm in the long run. Business value expands concept of value of the firm beyond economic value. Some of the forms may not directly be measured in monetary terms as it may benefit the business indirectly.

The same is true to UX design projects as not all of them may have a direct economic value to the business like user task efficiency or user satisfaction of a free-of-charge digital product. Authors Hirsch et al. refer to this aspect of UX design value as "Hard Dollars" and „Soft Dollars" phenomenon where hard dollars are associated with expected return that will directly influence profitability by increasing revenues or decreasing costs whereas soft dollars are refered to a return that may achieve a business or user goal, but can not realistically be expected to directly predict changes in revenues or costs (Hirsch, S., Fraser, J., Beckman, S., 2004, 14). Further, „different entities in the business might have different prioritities and assign different values to the same benefits, therefore companies have to establish broadly inclusive valuation methods in order to capture the value of different capabilities" (Harris, M., D., Herron, D. E., Iwanicki, S., 2008, 13).

As stated before, the goal of UX design projects is stimulating user behavior that would be valuable to the business. Therefore there is a need to identify the causes and cirscumstances that will determine whether a user behavior pattern is valuable to the business. **In other words, there is a question of how to assess whether some specific user behavior that was stimulated by UX design will lead to decreased costs or increased income.** In addition, one pattern of user behavior may have a direct financial outcome while another way in which users behave may only have indirect benefits. Therefore UX design valuation methods should capture both of those aspects.

The analysis in this chapter is aimed at revealing the main development and application principals of chosen methods in order to understand how companies could create a system of analysing investments to UX design. So this chapter has no goal of describing all possible financial and non-financial methods of valuing UX design. Contrarily, six methods were chosen in order to demonstrate the similarities and differences, pros and cons of those methods. At the same time it is understood that calculating the future value of investments requires to assess many side factors like competence of the staff, outer threats, technological risks, experience in the field and so on. On the other side, it is clear that any kinds of calculations of future investments involve some educated guesswork. Those aspects will not be analized in this chapter.

ROI and other methods are most commonly used for two purposes (Hirsch S., 2004, 8, 10):

1. To predict the value of individual projects when considering investments. Those methods allow to compare the financial value of different possible projects and make informed prioritization choices about which projects need to be funded.

2. To evaluate the success of investments after they are made. Accountability for the results is ensured as those methods usually set performance goals and enables to understand whether those projects were successful.

2.1. Return on investment (ROI)

Return on investment (ROI) „is a key financial metric that determines the value of business investments and expenditures“ (Burby, J., Atchison, S., 2007, 98). ROI refers to a financial analysis ratio that measures the net benefits of a project against its total costs (Hirsch, S., Fraser, J., Beckman, S., 2004, 8). Subjective factors are considered alongside the ROI calculation, including experience in similar areas and the strategic value of entering a particular market; however, ROI provides a bottom-line figure for comparing expected financial results independent of these other considerations (Hirsch, S., Fraser, J., Beckman, S., 2004, 8).

Mathematically speaking, ROI is a ratio of net benefits divided by costs and is usually expressed as a percentage (Burby, J., Atchison, S., 2007, 98):

ROI = [(monetary benefits – cost) / cost] × 100

ROI is valuable at comparing the costs to benefits in a ratio. But it is not enough to know that theoreticaly the benefits exceed the costs. It is equally important to forecast the timeliness of the returns.

2.2. Payback period analysis

Payback period methodology „[...] calculates the length of time it will take for the initiative to yield enough returns to pay for the initial investment“ (Burby, J., Atchison, S., 2007, 99). Payback is calculated by comparing the cumulative cash investment in the project and comparing against cumulative benefits. Most projects have a significant investment at the beginning of the project, and later the benefits overtake and exceed the initial and on-going investments required. The payback period is „[...]the duration from initial investment to the point where the cumulative benefits exceed the costs“ (Pisello, T.).

By going deeper into the calculations it is understood that investments made in a project the present day will need to return more in the future because of inflation as one dollar today will be worth less than one dollar in the future. In this step the Payback period analysis may be complemented by Discounted payback period method which takes the time value of money into account. Moreover, usually more than one investment is being considered at a time and this is the

reason why the forecasted return must be even bigger: the Discounted payback period also calculates the lost opportunity of investing the cash elsewhere (Pisello, T.).

2.3. Net present value (NPV)

NPV is a method that calculates „[...] the difference between an initial investment in a project and the cash flow the project generates, accounting for the time value of money“ (Turner, W. C., 2011,54). In other words, NPV calculates all of the net benefits of a project, adjusting all results into today‘s dollar terms: this is different than just calculating all of the net benefits of a project over a period without discounting as the cumulative benefits without discounting overstate the overall project value, especially when many of the investments costs are incurred in the first year and the benefits are tangible only in later years (Pisello, T.). However this metric alone does not highlight how long it may take to achieve the benefits as Payback period does. Nor does it higihlight the ratio of costs versus the net benefits as Return on investment does.

To summerize, all of the above methods have pros and cons and therefore in practice usually more than one method is used in valuing investments. However, all of those methods are good enough indicators to orient the team towards sound decision making. What is important in order to apply those methods in the field of UX design is the precision in calculating the monetary benefits part of those calculations. In other words, the financial methods may be seen as just a formula: if one knows the most likely benefits and costs required, it is quite easy to calculate the business value. But the financial methods themselves are not able and do not have a goal of assessing the benefits of UX design projects. This is the reason the next methods of UX design valuation are discussed further.

2.4. User experience Value Chain

Some practitioners identify the theoretical benefits of UX with the term ROI refering for example increased user productivity to internal ROI or decreased customer support to external ROI (Marcus, A. and Asociates, 2004, 2-3). And these statements are sometimes made without rigorous calculations. Another example of abstract claims of UX value would be stating that UX design provides strong ROI because improving the usability of a product or service has immediate benefits like satisfied customers, improved brand perception, decreased development time and therefore decreased time-to market figures (Momentum Design Lab, 2009, 1). It is even sometimes stated that statistics showing sales increases after a user interface redesign at one firm is a prove that UX design increases product sales by some avarage figure in another.

However the *monetary benefits* part in the previously mentioned financial calculations must be precisely implemented in order to be able to make reasonable claims about the economic value of UX design. As stated before, the goal of UX design is forming user behavior that would benefit business. Hirsch S. et al. claim that „[...] the key to calculating the ROI of UX design is making the connection between user behavior and business goals“ (Hirsch, S., Fraser, J., Beckman, S., 2004, 8, 13).

In addition to that user behavior may have direct value (*Hard dollars*) and indirect value (*Soft dollars*), authors Burby J. et al. divide user behavior to *direct* and *indirect* behavior according to where the behavior is happening – in an online platform of the business or starting in one platform it may end in another web ir mobile application or even offline (Burby, J., Atchison, S., 2007, 95-96):

1. **Direct behaviors** are those that happen on the website or application and has a direct impact to the bottom line. Examples would include direct sales on e-commerce platforms or revenue from visitors clicking on advertisements. If the goal of a site was maximizing the number of generated leads, direct behavior would be visitors making inquiries online. After that the result of generated leads should be tracked – what was the number of leads in a particular timeframe, what were the avarage sales values of online leads.
2. **Indirect behaviors** refer to customers‘ actions that firstly occure on the website or application but the value to the business is created by the behavior which may have ended elsewhere – on another website or even offline (in a physical store). An example would be websites or applications which have an objective to drive customers to partner sites. A customer that has navigated to a partners‘ or resellers‘ site would be an indirect behavior. In order to understand the value of a referall there would be a need to calculate what percentage of referred customers made a purchase, what was the average revenue. Another example would be online platforms displaying goods and services and visitors who use those kind of platforms for showrooming and later end-up purchasing those goods.

Furthermore Hirsch S. et. al. claim that alongside aligning with business objectives the UX design goals of forming user behavior must be as well aligned with financial outcome. This aspect is critical in measuring the business value of UX design as UX design is targeted at influencing desired user behavior and user behavior connected with financial outcome enables to calculate the economic value or *net benefits* of UX design projects. In other words it is the need to put monetary value on user behavior that was formed by UX design initiatives. The process of assigning values to website or application behaviors is known as monetization and most often those behaviors are

directly involved in driving the overall business strategy (Burby, J., Atchison, S., 2007, 90-93). This step requires determining the KPIs of user behavior and defining the financial value metrics related to certain user behavior.

Hirsch S. et. al. proposes the **UX Value Chain method** which is a process compromising of six steps starting with business goal setting and ending by assessing the value of UX design initiatives and setting further investment budgets (Hirsch, S., Fraser, J., Beckman, S., 2004, 8, 17-22):

1. **Identifying business problems and opportunities**

   In this step, a list of business problems and opportuinites to realize through user experience projects should be created.

2. **Identifying metrics and measuring**

   This is the step were connection between user behavior and business value is made, using a financial metrics. Non-financial metrics should also be considered. The outcome of this phase should be a business case that includes a ROI value.

3. **Choosing projects**

   Using the business cases developed in the previous step the relative value of each UX design project is rated and go/no-go decisions are made based on resource constraints. Valuation methods like ROI help by providing a rational basis to make rational comparisons of different projects.

4. **Designing and testing**

   The business cases constructed in the second step provide metrics with specfic success criteria againts which UX design results should be tested.

5. **Assessing actual value**

   This step is accomplished by re-measuring user behavior and associated value metrics in order to determin the actual degree of business impact. If a design solution is not successful, analysis of relevant metrics is a starting point for determining the reasons of failure and developing better design solutions in the future. However the goal of establishing UX design as a competitive resource of the firm hinges upon providing value over time.

6. **Setting budgets**

   This step is proposed in order to advocate for greater resources once the UX design team proves its ability to deliver business value. The UX value chain method is a circular process that starts over after the value of UX design is assesed and new resources are set.

To summerize, the value of UX design may be measured by linking business objectives with user behavior. Every business has a goal of maximizing profit by increasing revenue and decreasing costs. So it is certain that investments in UX design have to be made with the aim of increasing revenue or reducing costs. It is logical that the achievement of the latter goals may be calculated by tying user behavior to company‘s financial metrics or, in other words, by putting a price tag on certain user behavior that is considered valuable to the business. This way the UX Value chain method solves the issue of proplexity in estimating net benefits of UX design.

What the UX Value Chain method proposes is a comprehensive tool to manage UX design investments. It suggests putting focus on the inputs and outputs of UX design projects – the business goals that inform the design, and the behavioral and financial changes that were achieved as a result. It creates a framework that urges to answer the questions whether web or mobile application design changed user behavior, how valuable that behavior change was to the business, whether it was worth the investment.

However this method does not specify the ways how connection between user behavior and financial metrics should be implemented nor does it analyze the ways how indirect value of user behavior could be tied to financial results.

However it is also clear that the concept of business value covers not only economic value but also the value that contributes to the bottom line indirectly. UX design as well may create value that directly incluences financial results or benefits the business indirectly. Therefore there is a need to examine the ways to assess direct and indirect value of UX design.

2.5. User experience Balanced scorecard (UX BSC)

Carl W. Turner describes the balanced scorecard method as a tool for direction on how to align UX activities to company goals (Turner, C. W., 2011). As stated by Hasan H. et al., „the balanced scorecard is a formal management technique that is built on the premise that measurement is prerequisite to strategic management“ ((Hasan, H., Tibbits, H., 2000, 439). The concept of balanced scorecard proposes that alongside direct financial gains the business value is also accumulated through nonfinancial means and it is important to include intangible assets in value calculations.

Martinson M. et. al. add that traditional valuation methods focus on well-known financial measures, such as return on investment (ROI), net present value (NPV) or the payback period, but these types of measures are not well suited to valuating systems that provide a wide range of benefits, including those that are intangible in the nature: improved customer service or higher degree of competitiveness (Martinsons, M., Davison, R., Tse, D., 1999, 72).

BSC adresses the shortcomings of financial measures by introducing three additional categories of measures: customer perspective, internal business perspective, and innovation and learning perspective – all three areas that are important drivers of future financial performance (Turner, C. W., 2011, 54; Hasan, H., Tibbits, H., 2000; Mistry, J., 2002).

1. **The financial perspective** is defined by a mission to succeed financially by delivering value to stakeholders. It represents tradicional accounting measures that report the financial consequences of actions already taken. It concentrates on measures related to profitability, growth, cash flow, ROI and others.
2. **The customer perspective** is described as a mean to achieve the companies‘ vision by delivering value to the customers. It highlights the factors like value for money, time, performance. Performance indicators include numbers of unique visitors, customers and other.
3. **The internal perspective** is related to satisfying the shareholders and customers by promoting efficiency and effectiveness in business processes. This perspective is designed to focus on business activities that must be performed in order to satisfy the expectations of customers. Metrics include quality, cycle time, efficiency of operations.
4. **Learning and growth perspective** has a goal to sustain innovation and change capabilities through continuous improvement and preparation for future challenges. It is seen that businesses must ensure continuous improvement in order to have the ability to introduce new products in the future.

The implementation of BSC method begins with setting of goals in those four perspectives. When goals are set, strategies to achieve them are developed. Those strategies must have measures and performance targets. What balanced scorecard is exclusive about is its aim to include both quantitative and qualitative measures, both indicators for outcomes and indicators for performance drivers and as well the aim to identify cause-and-effect relationships between items across the four perspectives (Hasan, H., Tibbits, H., 2000, 443). The BSC shows a comprehensive view on the performane of the business as shown in figure 4:

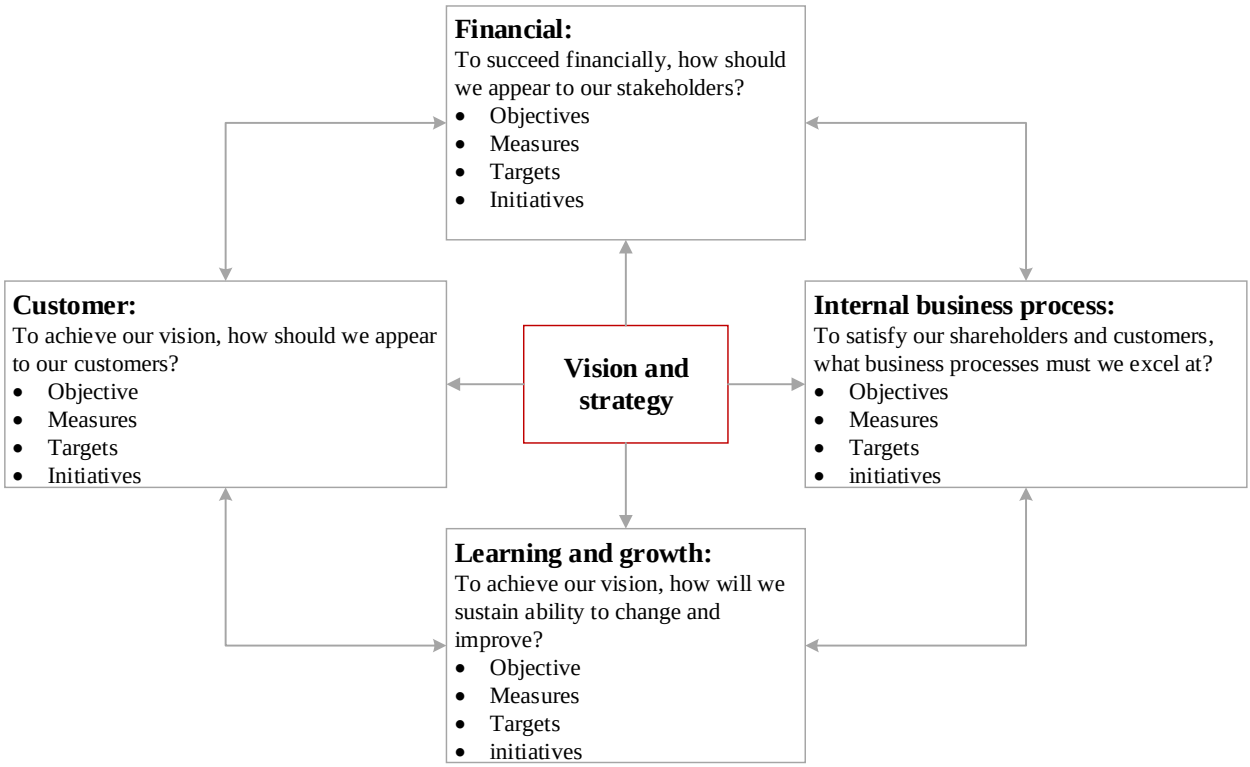

Figure 4. The four perspectives of balanced scorecard

Source: Turner, C. W., 2011, 54; Hasan, H., Tibbits, H., 2000; Mistry, J., 2002

As stated by Martinsons M. et al., the implementation of balanced scorecard must follow three principles (Martinsons, M., Davison, R., Tse, D., 1999, 83):

1. **Cause-and-effect relationships.**

   These reletationships should involve the before mentioned perspectives in the BSC framework. For example better staff skills (future readiness perspective) is likely to reduce the frequency of bugs in an application (internal operations perspective) and the latter is likely to meet end-user expectations (end-user orientation perspective).

2. **Sufficient performance drivers.**

   The balanced scorecard should include a mix of outcome measures and performance drivers. For example outcome measures like staff productivity without performance drivers like staff education do not explain how the outcomes will be achieved. Performance drivers in turn without outcome measures would fail to expose whether operational improvements had and impact to financial performance.

3. **Linkage to financial metrics.**

   The goal of a BSC is demonstrating how the three perspectives improve the overall financial outcomes of the business therefore end-user orientation, future readiness, internal operation perspectives should be tied to financial performance.

So balanced scorecard maintains a „[...] balance between short-term and long-term objectives, between financial and non-financial measures, between lagging and leading indicators, and between internal and external performance perspectives“ (Hasan, H., Tibbits, H., 2000, 440).

The important characteristic of balanced scorecard is its flexibility to adapt to certain strategic goals of an organisations. Though one of the three principles of BSC implementation described by Martinson M. et al. states that the goal of BSC is to demonstrate the improvement of financial performance, there are also attempts to create adaptations of BSC for non-profit organizations or seperate business units like e-business or IT. In those cases the perspectives of balanced scorecard are chosen depending on the mission and strategic goals of an organization or its unit. For example, Martinson M. et. al. proposes a balanced scorecard for strategic management of information systems in an organization and replaces the four persectives of a traditional BSC to business value (1), user-orientation (2), internal process (3) and future readiness (4) (Martinsons, M., Davison, R., Tse, D., 1999, 75). This way the goal of IS BSC changes from demonstrating financial performance to demonstrating the business value of information systems. Another example would be an e-busines balanced scorecard offered by Hoitash R. et al. which has the perspectives of e-business financial contribution (1), user-orientation (2), operational excellence (3) and future orientation (4) (Hoitash, R., Kogan, A., Srivastava, R. P., Varsarhelyi, M., 2003). Thus the goal of e-business BSC is demonstrating the contribution of e-business unit to the corporate bottom line.

On the basis of those examples and the principle of changing the BSC perspectives according to the mission or strategic goal of a business unit a user experience design balanced scorecard could be proposed. Carl W. states that UX design practitioners should realize that the possibility to create different perspectives of BSC provides UX designers with the opportunity to contribute to startegic decisions (Turner, C. W., 2011, 54-56). Van tyne S. proposes a UX balanced scorecard which maps the user experience process and skills to customer satisfaction and financial growth as shown in Table 5 (Van Tyne, S.). The learning and growth perspective was changed to employee perspective.

Table 5. The user experience balanced scorecard

Source: Van Tyne, S, 2012

Perspective	**User experience strategy**	
Financial	Increase revenue	Reduce costs
Customer	Increase conversions, retention, and loyalty	Increased effectiveness (task completion) and efficiency (time on tasks) and reduce Training and Support
Process	Conduct user research and iterative design review with your customers	Conduct usability evaluations with your customers‘ end-users
Employee	User researcher, Information architect, Visual designer, Interaction Designer, Usability Engineer	

To summerize the analysis of methods of user experience value measurement, a conclusion could be made that the financial methods propose the narrowest way to calculate the value of UX design while the balanced scorecard method gives the broadest picture and enables to capture the value of UX design through different perspectives as shown in Table 6.

Table 6. Comparison of e-business value measurement methods of UX design

	Financial methods	**User experience value chain**	**Balanced scorecard**
Principles of measuring the business value of UX design	Calculating the monetary benefits and costs; Calculating the lenght of time for investment to pay back; Adjusting net benefits into today‘s dollar terms.	Tying UX design goals to business goals; Tying UX design goals of facilitating user behavior to financial outcome; Monetizing the required user behavior.	Tying UX design goals to business goals; Creating UX design goals in customer, business process and innovation perspectives; Demonstrating cause-and-effect links between customer, business process and innovation perspectives and tying those perspectives to financial outcome

While financial methods theoretically answer the questions whether investments to UX design may be positive and if so, what is the payback period of those investments, the obvious shortage of those methods is that they give no clue of how to calculate the benefits or the value part of those investments. In other words, financial methods alone do not solve the problem of putting a value number on UX design projects. Therefore financial methods could be named as necessary but incomplete in calculating the value of UX design. The user experience value chain method adresses this shortage by proposing the principle of tying UX design goals to financial outcome. This method sees UX design as facilitator of user behavior and proposes to monetize that behavior. This way the user experience value chain method partly solves the problem of calculating the net benefits of UX design because the price tag put on behavior allows to know what financial value the formed user behavior brings to the business. And this in most cases may easily be assessed using online analytics after the UX design project is finished. The approach of linking user behavior to financial results is similar to the one proposed by balanced scored methodology. But in contrast to user experience value chain method, the BSC additionally evaluates the impact UX design has on business processes and innovation. The BSC enables to

demonstrate how all of those business areas are connected and what cause-and-effect relations lie behind them. This way unlike concentraining only to user behavior and its financial value, the BSC also shows, for example, how innovative UX design thinking changes digital product development processes which in turn may decrease development time by minimizing requirement changes or the amount of errors in wireframes and later in programming code. The improvement of time to market may have a positive effect to revenue growth while decreased development time is an obvious cause of cost reductions.

3. PRINCIPLES OF USER EXPERIENCE DESIGN VALUE MEASUREMENT

On the basis of theoretical aspects that were presented in the first two chapters of this paper, six principles are proposed which need to be followed in measuring the e-business value of UX design. Those principles will be taken into account during the quantitative research as well as creating the e-business value measurement model.

1. **Value of UX must be measured in the context of one‘s own company.**

   At least two of the myths of Usablity ROI proposed by Rosenberg D. relate to this principle (RosenBerg, D., 2004, 24-28): in case UX value is not measured in one‘s own context, there will be a lack of empirical data that support ROI claims. Theoretical knowledge about the success of any kind of functionality, content structure or design pattern in a specific market or product does not necessarily mean it will succeed in the context of one‘s own business case because of specific customer needs, competitive landscapes and other possible factors. Relying on published studies for evidence of ROI in UX activities is unconvincing.

2. **Value of UX activities must be measured apart from other business iniciatives.**

   As stated by Rosenberg D. (RosenBerg, D., 2004, 24-28), abstract ROI claims can also ignore other contributing factors to product improvement. Which means companies usually plan and implement UX activities along with marketing campaigns, sales strategies, customer service programs. In order to put a value tag solely on UX, one needs to measure the impact of UX apart from other initiatives. This requires companies have transparent business processes with agreed upon steps, roles and responsibilities. This principle relates to the described scope of user experience in the first chapter of this paper.

3. **UX activities must be aligned with business and/or product goals expressed as metrics.**

   Any metric is unlikely to be useful in practice unless it relates to a goal (Rodden, K., Hutchinson, H., Fu, X., 2010, 3) According to Carl W. Turner, therefore measuring the value of UX requires (Turner, C. W., 2011, 54):

   a) understanding UX‘s value to the company

   b) identifying metrics that drive company – or department-wide decisions, and

   c) drawing a clear and obvious connection between one‘s measurable value and a company – or department-wide metrics. For vizualized view see Figure 5. As was stated in the second chapter of this paper, there are two main goals of every business company: to increase income and to decrease the costs of delivering a product or a service. All other

business goals that emerge from business strategies must be aligned to those two business objectives.

Figure 5. Aligning the value of UX to business goals

4. **UX metrics must be used to track progress towards business and/or product goals.**
   Metrics must be used to track progress towards goals that they are tied to. Metrics must not only serve as a target to aim at but an approved process must exist which would ensure timely changes carried out by those who are responsible for improvement of results. In other words metrics that do not drive action, are worthless. Metrics that are not actionable are also called “vanity metrics” by Croll A. and Yaskovitz B. (Croll, A., Yaskovitz, B., 2013, 19). It is also important that people being measured would have the authority and resources to change the product development elements that are being measured. If it is not the case, the metric may be valid, but it needs to be shared with another group of people in the business (Turner, C. W., 2011, 53-54).
5. **UX design must be targetet to forming user behavior.**
   The goals of UX design must be understood as designing the users‘ interaction with the aim of satisfying user needs and achieving business goals. The term of designing interaction means forming the user behavior. So it is the need to measure whether the behavior that was formed by UX design initiatives contributed to achieving the business objectives.
6. **The user behavior that is tied to business goals must be monetized**
   In measuring the e-business value of UX design there is a need to assess whether the user behavior that was stimulated by UX design will lead to increased income or decreased costs. In other words, UX design initiatives that were tied to business objectives must be as well aligned with financial outcome. This way, by monetizing the user behavior it becomes possible to measure the economic value or net benefits of UX design.

4. RESEARCH OF USER EXPERIENCE DESIGN VALUE MEASUREMENT

4.1. Methodology of research

In order to carry out the research in this study and to clarify the opinion of various e-business experts on the topic of e-business value of UX design, a qualitative form – standardized interview was chosen. The author of "Social Science Research Methodology" Rimantas Tidikis states that data obtained during a qualitative research that invokes direct conversation gives more profound information about the object compared with the quantitative research (Tidikis R., 2003, 357). Another methodology expert Kęstutis Kardelis proposes interview method as one of the most reliable and approves that it allows to obtain the most complete information in social studies (Kardelis K., 2005).

A qualitative study is commonly used to explore new phenomenas and processes, which are not widely applied. It is also used in case methods and models for the application of those processes are yet to be determined. The qualitative study is considered the most valuable when the author of the study has personal experience, prior familiarity regarding analyzed topic. This way connections between the thoughts of experts and theoretical analysis as well as practical experience are made.

The questionnaire for this research was prepared in accordance with the general requirements set by Kęstutis Kardelis (Kardelis K., 2002, 93- 94). It is agreed that interview questions should be prepared in a way that minimizes the risk of incomprehension or inordinate effort to understand the topic or the questions themselves. Therefore questions were specific and explicit. It was also deliberately chosen to submit six open questions that are connected with each other and are aiming to analize the most relevant issues in this topic. Kęstutis Kardelis also states that it is important to follow the ethics of a qualitative research: it is the need to introduce respondents with the essense of the research and its value as well as to assure that answers will only be used for the purpose of this thesis (Kardelis K., 2005).

Questions prepared for this research are based on 4 interconnected topics as shown in **Figure 6**: measurement of e-business value of UX design, measuring user behavior, performance metrics, user experience related metric and user behavior related metrics.

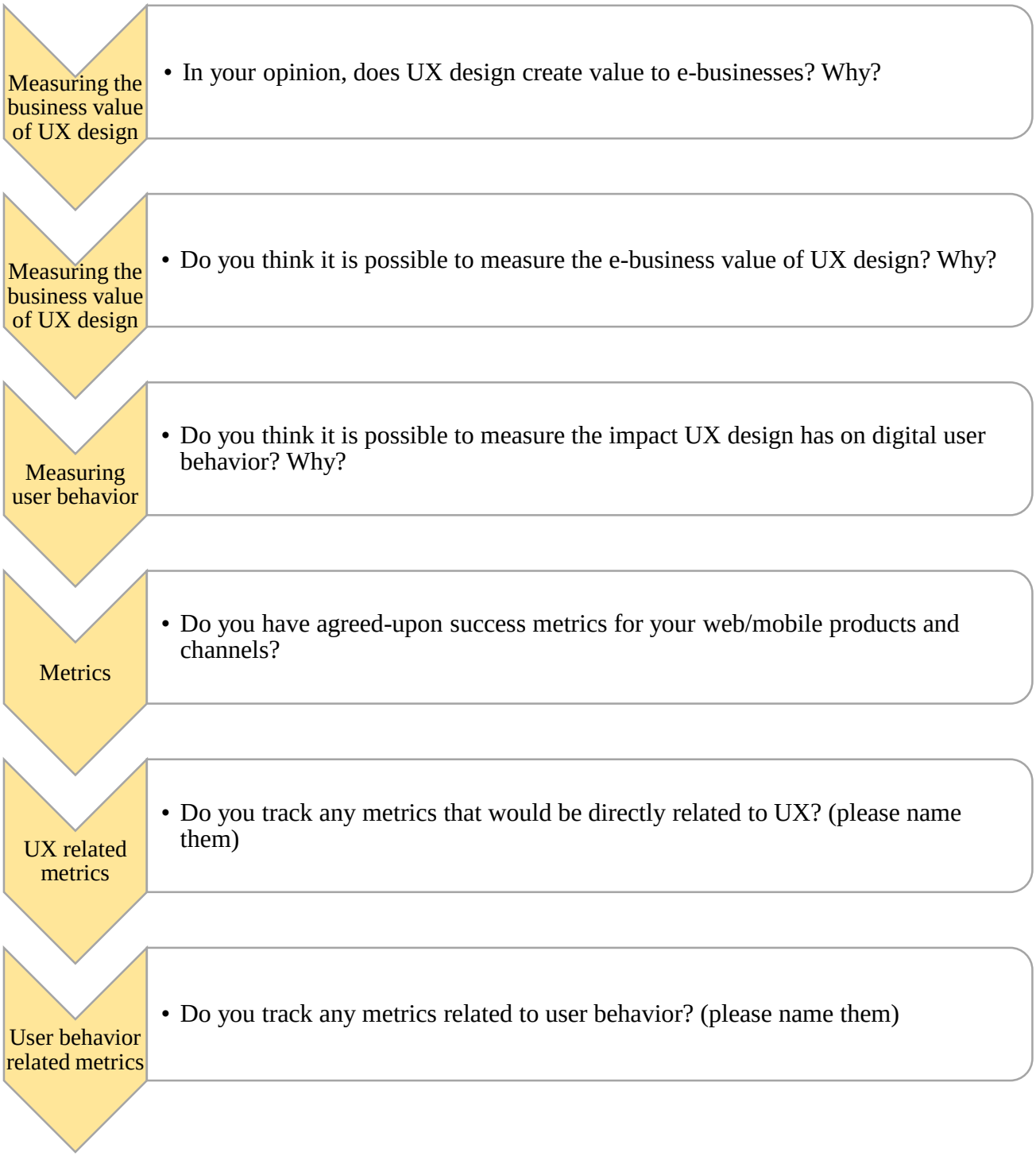

Figure 6. Interview questions of the qualitative research

The questions were created on the basis of the theoretical part of this thesis. The questionnaire was assembled in a way that firstly come the questions related to subjective opinion on general aspects of user experience value measurement and later every next question raises more narrow topics relating to measurement of e-business, user experience and user behavior. This order of questioning enables to firstly capture the subjective opinions of experts and later understand and interpret the measurement methods that are used in their daily practice.

The first question regarding subjective opinion whether user experience design is valuable to e-business is closely related to the second question which asks if the value of user experience design could be measured. This way it was aimed to observe whether opinion about possibilities to measure the value of user experience may be related to the answer if user experience design is valuable in general. As stated in the theoretical part of this thesis, user experience design is related to forming user behavior therefore a question was raised if experts believe it is possible to measure the impact that user experience design has on user behavior. Having the answers to those three before mentioned questions, the next three seek to specify the methods that are applied in practice. Firstly, it was the need to observe whether any type of agreed-upon metrics were applied in their field of business. This was done with the aim of understanding the maturity level of the performance measurement system in the business. It was also seeked to determine whether the maturity level of performance measurement has any relation to application of metrics related to user experience or user behavior. As stated in the first chapter of this thesis, UX design metrics may be decomposed into two large groups according to which of two áreas of UX they are assessing: the first group is designed to measure the usability of the product while the second group aims to measure the success in modelling the behavior of users. Therefore the penultimate question was purposely formed in a way that respondents would firstly reveal if and what UX metrics they are applying in their field in order to spot what metrics will be related to UX and whether any of those will include metrics related to user behavior. The last question is directly related to metrics that measure user behavior.

The research has been implemented in a period of two months in March – April 2015, five respondents were interviewed:

1. Gytis Česnuitis (E. publishing products manager, JSC Šviesa);
2. Povilas Redko (Director of JSC Media Park);
3. Ernesta Juodviršienė (Head of E. commerce department, JSC ALG knygynai)
4. Dainius Blynas (Head of E. book development, JSC ALS sprendimai)
5. Donatas Lileikas (Head of Management department, X)

The goal of the research: to find out e-business experts‘ opinion towards measuring the e-business value of UX design and to learn the methods of UX measurement applied in their daily practice

The objectives of the research:

- To find out the subjective opinion of experts whether UX design is valuable to e-businesses;

- To find out if the value of UX design is considered to be possible to measure
- To find out whether UX design is considered a facilitator of user behavior and whether the impact UX design to user behavior could be measured
- To find out if e-business experts are using agreed-upon success metrics for web / mobile products and channels they are managing or developing
- To find out if business experts are tracking any metrics that would be directly related to UX and user behavior.

The object of research: Measuring the e-business value of UX design.

Optimal source of information: in order to obtain optimal information for this research, it has been collected from e-business experts that represent different business segments: companies that are the e-business owners and the ones that offer digital product development services. The aim was to capture the possible differences or similarities in describing the topic.

Characteristics of respondents: interview questions were given to experts occupying different managerial positions in e-business sector as well as representing companies functioning in different e-business sectors. The group of respondents was formed of e. product manager, who is responsible for financial results of digital products and introduction of new digital products to the market; Head of E. commerce deparment; E. books development manager and two leading experts from different e. product development agencies.

Data processing techniques: data was analyzed by discussing the answers in comparison, as well as grouping them and distinguishing into categories.

4.2. Analysis of research data

Firstly, all of the respondents were asked to present their subjective opinion whether user experience design creates value to businesses. All of them expressed an opinion that business value is created by UX design. It is interesting to note that respondents indicate different reasons why UX design is valuable. Also there were different positions towards the end result that UX design creates. Respondent Gytis said he is certain that „UX design of modern digital products creates the same value to businesses as quality of any other (non-digital) product“. To illustrate his answer Gytis named two hypothetical business cases – companies that operate in different business branches: one that manufactures furniture and another that has developed a mobile application which helps to lose weight. For the comparison to be fairer, Gytis suggests that both of those companies operate in a highly competitive market where customers have an opportunity to choose. Gytis states that if the manufacturer would deliver uncomfortable or low quality

furniture that would wear away after a few months, the customers shared this information with friends, acquaintances or even strangers through all possible channels. This in turn would have an impact to the image of the firm and as a result – an impact to its financial results. The other company that has presented a mobile application to the market would encounter similar consequences if one day the user that aims to lose weight and registers it in his mobile application on a daily basis would notice that all of his data was lost. And what if all of the users would lose their data? The company would face negative reviews, customers that demand to return their money and finally falling income. **With the help of those two examples Gytis exposes the value of UX design through negative outcomes if a company will decide not to invest in UX design. The examples show that UX design is understood as a means to ensure product quality.** As stated by expert Ernesta, UX design is undoubtedly valuable to businesses. It is interesting that Ernesta, differently from other respondents, sees quite a broad scope of UX design projects. She says that during UX design a broad extent of analysis should be performed – sales analysis, customer needs and customer behavior analysis, usability testing. As a result of such service businesses should be able to observe what actions should be taken in order to meet customer needs and expectation, in order to ensure easy and simple sales process, in order to ensure customer satisfaction. As stated by Ernesta, great user experience ensures customer satisfaction, fosters loyalty, attachment to a brand name and, eventually, all of this converts to growing sales. **So the value of UX design is related to positive customer emotions and loyalty which both have a positive impact to financial results.** Dainius relates the value of UX design to ensured ease of use of a product. According to Dainius, the usability and easiness of use is a benefit for the user and therefore a direct value to the business. **Dainius adds that the easiness of use alone is a value that could be monetized**. **Donatas, similarly to Ernesta, links UX design to customer satisfaction and loyalty.** He states that online customers want to perform actions fast and easy. „If the product you created is able to pleasantly surprise the customer with the way it looks, feels, with exclusive and unseen solutions that enables the customer to achieve her goals in an optimal way, you will be remembered for a long time.“ Povilas expressed an interesting opinion that UX design creates a lot of value for businesses, yet it‘s not always noticable and some people might think it‘s not really important. Povilas relates the value of UX design to user behavior in the first place. This correlates with the ideas written in the first chapter of this thesis. According to Povilas, „the purpose of UX is to make everything look and feel just right - this includes simple things, such as menu and button placement, as well as more complex product elements, such as thought out shopping cart step design, user interaction flow and others.“ There are seen differences between digital and physical products: the value of UX design in digital products is related to ensuring the easiness of use and improving user behavior metrics such as conversion rate: „in

terms of web and mobile development, proper UX design can guide users through the product and increase conversion rates“. While for physical products the most important criterias are quality and good emotion which creates customer satisfaction which is valuable to the business. **So the value of UX design is also said to be related to forming user behavior and increasing customer satisfaction.** The summary of the answers to the first question is shown in Table 7.

Table 7. Summary of the answers to the first interview question of the qualitative research

	In your opinion, does UX design create value to businesses? Why?
Gytis Česnuitis	UX design is understood as a means to ensure product quality. UX design creates value because it ensures customer loyalty and improves financial results.
Ernesta Juodviršienė	UX design is considered a tool to ensure a simple and easy purchase process and a means to create positive emotion. The scope of UX design is believed to cover the analysis of business goals and user needs. UX design creates value by assuring customer satisfaction, fostering loyalty and improving financial results.
Dainius Blynas	UX design is understood as a means to create usable products. The good UX itself is considered valuable because good UX can be monetized.
Donatas Lileikas	UX design is related to ensuring easiness of use and creating positive emotion. UX design creates value by ensuring customer satisfaction, customer loyalty and positive financial results.
Povilas Redko	UX design is related to shaping needed user behavior. The value of UX design is seen in the ability to create needed user behavior. Value is also created by ensuring customer satisfaction.

The second question asked for subjective opinion about the possibility to measure the e-business value of UX design. Though all of the respondents unanimously said that UX design creates value to the business, not all of them agreed to an idea that the value of UX design could be measured: two of them said that the value could only be measured to some extent, one respondent declared that the ROI of UX design would be impossible to calculate, and two said that the value is measurable and that is not a difficult task. As stated by Gytis, „it is possible to measure the value of UX design and that is not difficult to accomplish: digital products (in comparison to physical ones) are great in a way that by analyzing the user behavior we are able to make decisions about which elements need to be changed or adjusted and which ones benefit customers the most.“

Thus in order to increase revenue it is the need to look for product elements which, improved by UX design initiatives, would deliver the biggest benefits. As told by Gytis, this is quite easily achieved during A/B testing and analyzing in which cases users would be ready to pay the biggest price. So if in the previous answer UX design was named as a method to ensure product quality and customer loyalty, in the second answer Gytis relates the result of UX design to forming and monetizing user behavior. This idea correlates with the core principal of UX value chain method – one has to monetize desired user behavior in order to calculate the ROI of UX design. This also coincides with the 6th and 7th principles of UX design value measurement that were presented in the 3d chapter of this paper: UX design must be targetet at forming user behavior, user behavior goals must be tied to business goals and the user behavior must be monetized. Dainius shares the opinion of Gytis that **the value of UX is possible to measure by stating that there is direct correlation between good UX design and business value because one can charge an easy-to-use product a higher price.** However Dainius adds that the measurement of UX design value always depends on business goals and is particular to every separate business. This proposition coincides with the first and the third principles of UX design value measurement: „value of UX must be measured in the context of one‘s own company“ and „UX activities must be aligned with business and/or product goals expressed as metrics.“ On the contrary, Donatas states that the calculation of the economic value of UX is similar to the calculations of ROI of social networks – everyone understands that it is valuable but it is very difficult or impossible to estimate. On the other hand, Donatas specifies, that it is possible to observce positive changes in user behavior before and after the UX design project. Povilas agrees to Donatas that in most cases its hard to determine the exact value that UX provides to businesses: „generally though, UX is similar to advertising in a way that both are needed to make the product more successful, but the exact value added of each is not known.“ On the other hand it is measurable to some extend. Povilas mentions the method of A/B testing where computer algorithms change some properties in a live product, thus randomly presenting users with two different versions of some parts of the product. „By following user flow we can then measure the conversion rates of both versions and choose the best solution. In this case, value added for business is equal to the gap between those conversion rates.“ In some other cases, UX value is said to be possible to measure by organizing focus groups and analyzing user behaviour, although it’s much more time consuming and expensive. The answer of Ernesta is very similar to Povilas‘ because the value of UX design is related to transformed user behavior and improved conversion rate metrics: „[...] I believe that by analyzing sales figures, by analizing how users search for information, how they navigate on the site, by analyzing business goals and financial results, it should be possible to measure the impact UX design has on business results. For example, after some corrections of user interface which are designed to stimulate

online sales of a given segment, the results should demonstrate the value of UX design: it may be observed by showing if specific pages have more users, if the time on pages is increasing, if conversion is improving and sales are growing.“ The reason why the value of UX design is said to possible to measure only in some extent is closely related to the second principle of UX design value measurement. The principle states that value of UX activities must be measured apart from other business iniciatives; in order to put a value tag solely on UX, one needs to measure the impact of UX apart from other iniciatives. According to Ernesta, the thing with UX design is that businesses are usually implementing some other actions in parallel like marketing, pricing, communication and other. Therefore it would be every difficult to estimate the impact to better results by UX design, setting aside all other actions. If there would be a case where no other radical actions like large promotions were undertaken, the value of UX design was possible to measure. On the contrary, „[...] if business is undergoing strategy, pricing changes and at the same time it is carrying out UX design initiatives, I would say it would be very difficult to seperate and name the influence of marketing to better results and the influence of UX design to better results.“ Ernesta suggests and example where the business goal is to encourage users to review some sort of rubric on an e. commerce site. In order to achieve this result, UX design changes are implemented and priority for this rubric is strenghened by ensuring more visibility. But at the same time the marketing department runs a very active communication project which invites people to observe the rubric. How would it be possible to assess whether the more intensive traffic to the specific page was achieved by UX design or by an interesing message that was created by marketing? The answers to the second question are summerized in Table 8.

Table 8. Summary of the answers to the second interview question of the qualitative research

	Do you think it is possible to measure the business value of UX design? Why?
Gytis Česnuitis	Yes, it is implemented quite easily. The value is measured by analyzing user behavior and deciding which elements of the product are most valuable to the user, whether they would be willing to pay a bigger price.
Ernesta Juodviršienė	Measurable to some extent. By measuring user behavior after UX design is implemented, by measuring conversion rate changes.
Dainius Blynas	Yes, but measurement of UX design value always depends on business goals and is particular to every separate business.
Donatas Lileikas	ROI is impossible to measure.
Povilas Redko	Measurable to some extent. By measuring conversion rate changes that were influenced by UX design.

As not all of the respondents related UX design value to measuring the changes in user behavior, it was interesting to observe the answer to whether in their opinion it is possible to measure the impact UX design has on digital user behavior and why. The answers show unanimous approval that the impact UX design has on user behavior is measurable. However, Ernesta specified that the possibility of measuring the impact is limited: „if you are not implementing radical changes in your strategy, if there are no active marketing actions, it will be possible to measure. If you had other actions in paraller, it would be difficult to estimate the impact of UX design because the result would be created by a packet of actions. Though you will not be able to measure the accurate impact to sales growth, you will notice some sort of influence UX design has made.“ Gytis proposed an example of two large tour operators in Lithuania which both offer to purchase travels online: one of them requires to register on their site with an e-mail adress while the other asks to fill in passenger information without any registration. The requirement to register before the purchase is an additional step for the users. Given that both of those operators offer the same travel directions, the same hotels and very similar prices, the user experience of their websites have an impact to user behavior, i.e. they will make a purchase on the site that is more easy and simple to use. Dainius agrees with the idea by noting that the ability to measure customer behavior is the exclusivity of digital products. In addition, Dainius says that the quality of user experience is usually the only value that customers are seeking for. Donatas, though claiming that the value of UX design is impossible to measure, gave some examples of e. commerce, e. banking and e. government systems: „[...] the simplification and clarity brought by UX design to those systems

can be measured by not only user behavior online but also using metrics that measure user behavior offline. Examples would include changes in volumes of calls to support centers, changes in numbers of complaints or negative reviews about those systems.“ As stated by Donatas, it is also possible to measure whether the changes brought by UX design made those systems more usable, simplier, whether users are able to achieve their goals easier, whether they find the information that are looking for. Povilas agrees with the same idea told by other respondents that the impact of UX design to user behavior is measurable. It can be performed by A/B testing, focus groups or using analytics software: „it’s not that difficult to analyze average user flow with tools such as Google Analytics and then evaluate the impact after some changes have been made, since changes in user flow are visually displayed by the software.“ The answers to the third question are summerized in Table 9.

Table 9. Summary of the answers to the third interview question of the qualitative research

	Do you think it is possible to measure the impact UX design has on digital user behavior? Why?
Gytis Česnuitis	Yes, it is possible to measure practically every step of the user in the digital space and observe, how UX design decisions improve business results.
Ernesta Juodviršienė	Abilities to measure the impact of UX design to user behavior are limited. The reason is that the changes in user behavior are usually the result of a packet of actions.
Dainius Blynas	Yes, the ability to measure user behavior is the exclusivity of digital products.
Donatas Lileikas	Yes, it is possible to not only measure the online behavior but also assess the user behavior outside the online platform. For example, it is possible to measure if there are any changes in volumes of calls to support centers due to better UX design.
Povilas Redko	Yes, the impact of UX design to user behavior could be measured by implementing A/B testing, focus groups, also using analytics software.

As stated before, the first three questions were aimed at assessing the subjective opinion of experts on this theme. The last three relate to the practices that are carried out in their businesses. Firstly, in order to understand the maturity level of performance measurement systems in the companies that respondents represent, a question was asked whether they apply any agreed-upon metrics in their field. As some of the respondents represent companies of e-business and others are ambassadors of those that offer digital product development services, it was aimed to understand

both whether e-business owners have agreed upon success metrics for their businesses and whether product developers have success metrics for the products they create and develop. The answers to this question were diverse but quite laconic. The business owners Gytis and Ernesta have assured they have agreed upon metrics, while Dainius did not specify any of them but answered that he and his team are now working on creating a performance metrics system. Gytis specified that every company has to set goals and basic success metrics which would indicate whether the product meets the expectations of users nad whether it is successfull for the business (be it a simple website or a digital product like a mobile application). Those goals should be tied to overall business strategy and (ideally) to digital product strategy. Gytis claims that in his company every product has its specific goals ant metrics and, according to results, conclusions and decisions are made. Ernesta has specified that her company uses standard e. commerce metrics: „previously we have been measuring only traffic, conversion rates and time spent on some specific pages. But we gradually improve our performance measurement system: we analysis the sources of traffic, we observe what users are doing on our site, we measure how different pages are converting. Recently we dig deep into analyzing the effectiveness of sales promotions: how many newsletters were sent, what was the bounce rate, we compare promotes to one another, how effective were different marketing messages, what was the conversion rate of each promote, what was the increase in sales, revenue, how many items were return back and so on.“ Both respondents that represent digital product development companies, as expected, set product goals according to requirements raised by their customers and according to what digital product is being delivered. However, Povilas specified that „in most projects the key success metrics to the client are performance of the system, design, and ease of use. We don't typically delve into other metrics unless there’s a specific need for that.“ To generalize the answers it is seen that metrics related to UX design or user behavior are not included in overall e-business success measurement systems except the e. commerce case where conversion rates are measured. From the two companies that provide services of digital product development only one applies performance and usability measures to ensure the quality of e. products. Therefore the last two questions regarding the usage of metrics related to UX design and user behavior are aimed to extract more details about the measurement of UX design. The answers of the fourth question are summarized in Table 10.

Table 10. Summary of the answers to the fourth interview question of the qualitative research

	Do you have agreed-upon success metrics for your web/mobile products and channels?
Gytis Česnuitis	Yes. In our business group every digital product has its goals and, according to results, conclusions are made and corrective actions are taken if necessary. Product goals are tied to business strategy and e. product strategy.
Ernesta Juodviršienė	Yes. Mainly standard e. commerce metrics are used. We also track where the traffic is coming from, how the traffic converts to buyers. We also delve into analyzing the effectiveness of sales promotions.
Dainius Blynas	Not yet. We are working on creating a performance measurement system for our future e. product
Donatas Lileikas	Metrics that we are using to assess product success depend on our client's requirements. They differ in every project.
Povilas Redko	Metrics for measuring the success of created products depend on what the client is requesting. But we also have standard UX metrics for measuring the quality of user experience: performance of the system, design, and ease of use.

As was already said, the order of last two questions was selected purposely to assess whether businesses have diverse metrics related to UX design and those related to user behavior or, nevertheless, the respondents will notice that those two groups of metrics overlap and are closely related to one another. Of three respondents that represent e-businesses only one stated that UX was measured in his company. Of those that represent companies providing digital product development services only one declared that they use UX metrics while user behavior metrics were used by both of them. It is interesting that talking about UX related metrics Gytis stated that in his company UX is measured both observing the user behavior and talking directly to the users (for example, asking them to vote in Net Promoter Score metric). „We observe the behavior by calculating the number of actions that users undertook, the time they spent using our products, we measure customer loyalty, number of sessions, number of active users and we withdraw secondary data from those metrics." This answer suggests that in the case of the company that Gytis represents an advanced UX metrics system is used which encompasses self-reported metrics, engagement metrics, conversion rate metrics and performance metrics. While answering the question regarding metrics related to user behavior, Gytis gave a specific example related with a

mobile application for pupils that are preparing for exams which was recently presented to market: „We calculate and analyse perhaps all possible user behavior in the application and make product management decisions according to it. For example, more frequent openings of the menu page and less time spent on it, when the user swipes the screen instead of pushing the menu button, indicates that the swipe action is usually performed accidently. For us it is an indication that some changes to the structure and navigation of the application should be made. Another example would be related to users that answer test questions and read the explanation of the right answer: every user has the ability to rate the explanation. We in turn analyze the ratings and make corrections of the content on demand. Furthermore, we are looking for tendencies in user behavior and now we already know what content we should avoid in the future product development phases. Moreover, using analytics data we have an opportunity to rate the content by author and thus we already know what authors we will hire in the nearest future. All of the mentioned actions will improve user experience.“ If we remebered Gytis‘ answer about the overall e-business success metrics system, it was stated that every digital product has its own goals which are tied to business strategy and digital product strategy. Therefore a conclusion could be made that the metrics of user experience design are or could be dependent on the maturity level of overall performance measurement system that a company is employing. In other words, companies that are only beginning to track some analytical data usually start with basics that include those metrics that are offered by analytics software: number of users, time spent on site and so on. And on the contrary – those that have experience in applying and analysing data are more likely to measure the user experience using different types of metrics. In contrast, Ernesta states that UX related metrics are not used in her company: „[...] no, we use only generic e. commerce metrics. We do not employ specific UX metrics, we have not reached that level yet“. Though her earlier statements suggest that to a certain extent the user behavior is observed as well as conversion rate is calculated. However, it is obvious that there is little attention to measuring user experience in e. commerce. Ernesta confirms this idea by answering the question related to measuring user behavior. Ernesta states that so far little resources have been invested into measuring user behavior: „we only track those metrics that are offered in a standard Google Analytics package, we do not set user behavior goals yet.“ It is also interesting that Donatas who has argued that it is impossible to measure the ROI of UX design, gave some very specific examples from his work practice that relate to measuring user experience: „if the number of registrations is important for the client, we track how this number performs after the UX design project, how effective is the registration form in terms of error rates, we optimize the process on the basis of collected data. If the goal is keeping the user on site or stimulating the sharing of content, these will be the metrics of big importance. And, of course, we track the overall emotions of users after their visit – we are not able to observe it systematically but successful

products quickly appear on the net and especially in social media with positive reviews.“ Answering the question about user behavior metrics Donatas added that general user behavior is always being tracked: where and what users are doing. „For example, in the case of one project we wanted to boost sales of the main product therefore we development several alternative products and they were promoted in order to increase the traffic to our site. When the required traffic was reached, we made some user interface changes in order to direct users to the purchase of our main product.“ Meantime Povilas claimed that the company of his always has an opportunity to measure some UX metrics such as conversion rates, task completion rates and time spent on a specific task but they do not usually track these metrics unless the customer requires it. However they are always tracking user behavior like user flow, navigation patterns, general session time as well as feature usage.

To summerize the answers to the last two question it could be said that not all of the experts could have easily identified what do UX related metrics track and did not relate UX metrics to user behavior metrics. However there are examples which demonstrate that companies not only track UX but they employ different categories of UX metrics. The answers to fifth and sixth questions are summarized in Table 11.

Table 11. Summary of the answers to the fifth and sixth interview question of the qualitative research

	Do you track any metrics that would be directly related to UX? (please name them)
Gytis Česnuitis	Yes. We do it both by observing the user behavior and talking directly to the users. We observe the actions users made, number of sessions, number of active users, and we withdraw secondary data from those metrics.
Ernesta Juodviršienė	No. We use only standard e. commerce metrics.
Dainius Blynas	No, we are in the process of creating the performance metrics system, we do not use UX related metrics yet.
Donatas Lileikas	We also track UX metrics that depend on business or product goals.
Povilas Redko	We have an opportunity to measure UX metrics like conversion rate, task completion rates and time spent on a specific task, but we usually do not do this.
	Do you track any metrics related to user behavior? (please name them)
Gytis Česnuitis	We track and analyze probably all possible user behavior of our products. The metrics depend on the specifics of every product.
Ernesta Juodviršienė	So far we track only the behavior that can be tracked using standard Google analytics packages. We do not raise user behavior targets.
Dainius Blynas	No, the metrics system is still in progress, we do not use user behavior related metrics yet.
Donatas Lileikas	Yes, we always track generic user behavior metrics, we observe what users are doing online.
Povilas Redko	We usually track user behavior like user flow, navigation patterns, general session time as well as featuer usage. Yet we ourselves do not set user behavior goals.

4.3. Conclusion of the research

1. **Respondents indicate different reasons why UX design is valuable but all of them expresses an opinion that value is created by UX design.** The e-business value of UX design is related to quality of the digital product, to forming user behavior that is achieved

by UX design initiatives. There were also differences in positions towards the scope of UX design projects. However, all of the respondents agree that good UX design results in easiness of use, good emotion and customer satisfaction which translate to positive financial results.

2. **Not all of the respondents agree to an idea that the exact e-business value of UX design could be measured**: two of them said that the value could only be measured to some extent, one respondent declared that the ROI of UX design would be impossible to calculate, and two said that the value is measurable and that it is not a difficult task. Though four of five respondents **believe that measurement of UX value is related to analyzing user behavior.** One of the respondents relates the measurement of value to analyzing user behavior changes and monetizing them. The idea correlates with the core principal of UX value chain method – one has to monetize desired user behavior in order to calculate the ROI of UX design. There was also an idea expressed that value of UX design could be calculated just by charging an easy-to-use product a higher price. However it was also stated that UX design value always depends on busines goals and this proposition coincides with the first and the third principles of UX design value measurement: „value of UX must be measured in the context of one's own company" and „UX activities must be aligned with business and/or product goals expressed as metrics." Those who are sceptical towards measuring the e-business value of UX design state that UX is similar to marketing in a way both are needed to make the products successful but the exact value added of each is unknown. There was also an opinion expressed that relates to the second principle of UX design value measurement which states that the value of UX activities must be measured apart from other business initiatives. According to the respondent, the reason why the e-business value of UX design could be measured to some exctent only is the fact that businesses along side UX design usually implement some other actions like marketing, pricing, communication and other.
3. **Though not all of the respondents related UX design value measurement to measuring the changes in user behavior, the answers show unanimous approval that the impact UX design has on user behavior is measurable.** However, one respondent specified that the possibility of measuring the impact of UX design is limited due to the fact that the result of changed user behavior may be the cause of integrated set of actions. There was also an idea expressed that the simplification and clarity brought by UX design to digital systems can be measured by observing user behavior that appears not only online but also offline (changes in numbers of calls to support center, reviews of the product, etc.).

4. **To generalize the answers it is seen that metrics related to UX or user behavior are not included in overall list of e-business success metrics.** It was specified that every company has to set goals and basic success metrics which would indicate whether the product meets the expectations of users and whether it is successfull for the businesses. However, two respondents declared having agreed-upon success metrics while one of them is in the process of creating a measurement system. One of e-business representatives stated that the product goals are even tied to overall business strategy and to digital product strategy. However, another answer showed that only standard e. commerce metrics are measured as success metrics. Both respondents that represent digital product development companies, as expected, set product goals according to requirements raised by their customers and according to what digital product is being delivered. However, one of them specified that „in most projects the key success metrics to the client are performance of the system, design, and ease of use."
5. **From the answers related to metrics of UX design and metrics of user hehavior, it is seen that little attention is given towards measuring the outcomes and impact of UX design projects.** However, there were examples of using a UX metrics system which encompasses self-reported metrics, engagement metrics, conversion rate metrics and performance metrics. As this system is used in the same company where all product goals are tied to business strategy and digital product strategy, a conclusion could be made that the metrics of user experience design is or could be dependent on the maturity level of overall performance measurement system that a company is employing. In other words, companies that are only beginning to track some analytical data usually start with basics that include those metrics that are offered by analytics software: number of users, time spent on site and so on. And on the contrary – those that have experience in applying and analysing data are more likely to measure the user experience using different types of metrics. It was also noticed that experts do not always relate user behavior metrics to those that are measuring the success of UX design.
6. On the basis of this research a conclusion could be made that businesses are in need of a UX design value measurement model that would follow the principles of UX design value measurement ant that would enable to capture the e-business value of UX design activities.

5. USER EXPERIENCE DESIGN VALUE MEASUREMENT MODEL

5.1. Modeling methodology

Before presenting the model, which summarizes the results of this study, an analysis of modeling methodology must be made.

The Business Dictionary defines the concept of model as a "graphical, mathematical (symbolic), physical, or verbal representation or simplified version of a concept, phenomenon, relationship, structure, system, or an aspect of the real world" (at: http://www.businessdictionary.com/definition/model.html). When applied in scientific activity, model becomes an object that aims to make processes easier to understant, quantify and visualize. Ibrahim A. Halloun describes model as „[...] a sort of conceptual template with no specific content, but with the set of cells (dimensions) and associated guidelines for content developement [...] where model structure is the schematic dimension that converts the heap into coherant conceptual system of well-defined function" (Halloun, I., A., 2007, 40). Therefore the objective of the model refers to a question it can answer about the corresponding pattern. The structure of the model can be defined along four subdimensions or facets each dealing with specific aspects of model elements in their relation to formating patterns (Halloun, I., A., 2007, 50). These are the typology facet, the state facet, the interaction facet and the cause-effect facet. Within the typology facet the relative positions of various elements are set in an appropriate coordinate system; and causal facet is concerned with pattern explanation.

As Business Dictionary states the objectives of a model include: „to facilitate understanding by eliminating unnecessary components; to aid in decision making by simulating 'what if' scenarios; to explain, control, and predict events on the basis of past observations." (at: http://www.businessdictionary.com/definition/model.html). The models seek to present objects, phenomena or processes in a logical way. It is also argued that since many business processes are very complicated the essence of a model is to contain only those features that are of primary importance to the model maker's purpose.

Business modeling experts David M. Bridgeland and Ron Zahavi define the primary purpose of a business process model as „to communicate something about business to other people: employeers, customers, partners, or suppliers" (Bridgeland, D., M., Zahavi, R., 2008, 7). Other scientific sources say that model is an important tool when business companies are dealing with certain problems which they can not solve themselves, or they are facing new processes that needs

to be defined. Models can define new methods and become a guideline of upcoming processes for the entire management team.

Before the creation of the model, it is neccessery to define the technique of modeling. Jan Mendling‘s study „Metrics for Process Models: Empirical Foundations of Verification, Error Prediction, and Guidelines for Correctness“ proposes a concept of a modeling technique:

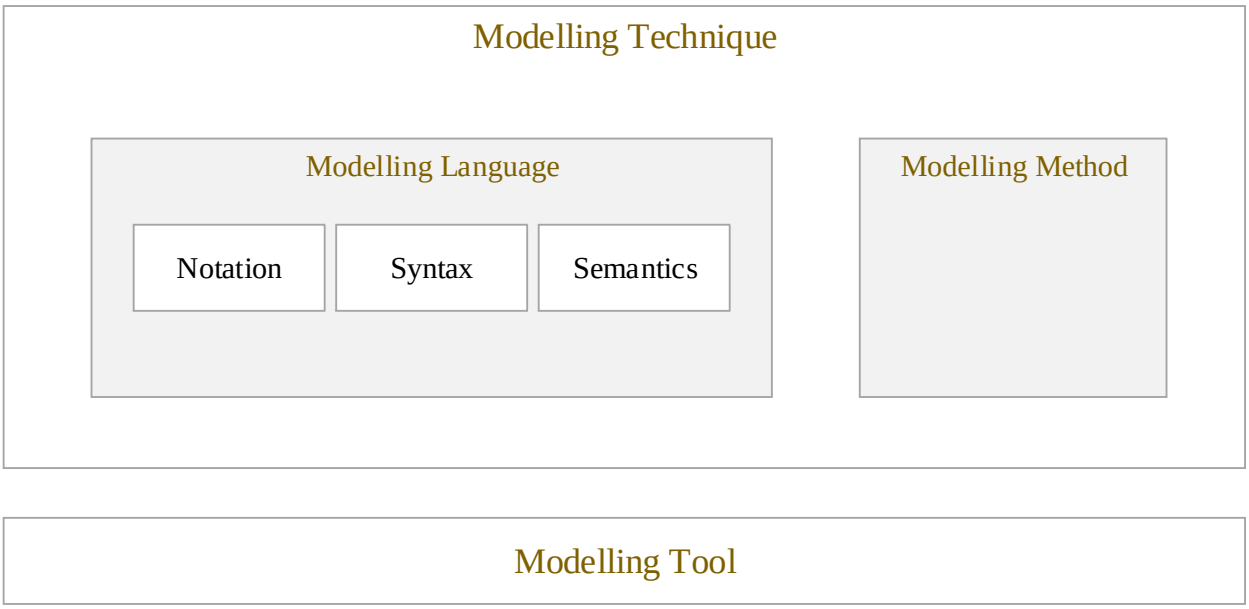

Figure 7. Concepts of a modeling technique

Source: Mendling, J., 2008, 8

As shown in Figure 7, modeling process starts by clearifying the modeling method and certain rules of modeling language. Mendling states that “modeling language consists of three parts: syntax, semantics and, optionally, at least one notation. The syntax provides a set of structs and a set of rules how these constructs can be combined. A synonym is modeling grammar. Semantics bind the constructs defined in the syntax to a meaning. The notation defines a set of graphical symbols that are utilized for the visualisations of the model“ (Medling, J., 2008, 8).

The methods for the model of this study will be based on Tom Ritchey‘s study “Outline for a Morphology of Modelling Methods Contribution to a General Theory of Modelling“. He states that there is no general theory of modelling as an “overall framework which treats the epistemological, methodological and operational aspects of scientific modelling as a whole – from physics and biology to design theory and social planning models“ (Ritchey, T., 2012). Instead of

giving a complete and logical definition of a scientific model, author puts forward what he considers to be **two necessary criteria** for something to be a scientific model:

A. A scientific model must contain two or more mental constructs that can serve as variables, i.e. dimensions which (at least potentially) can support a range of values or states.
B. One must be able to establish relationships either between the variable entities as such, or between the values of the value ranges within the variables (e.g. causal, probabilistic, logical, etc.) (Ritchey, T., 2012).

Based on this study, the important aspect of scientific modelling is to clarify what rules one is using while creating the model and to apply those rules consistently. In this study five properties will be followed which were pointed out by Tom Ritchey on the basis of the criteria given in A and B:

1. **Specification**: Are the variables of the model specified, i.e. contain a *well defined range* of ordered or non-ordered values or states; or are the variables unspecified and treated as black boxes?
2. **Directionality**: Are the connections between the variables *directed* or non-directed (symmetrical)?
3. **Quantification**: Are the relationships of connectivity between the variables *quantified* or non-quantified?
4. **Cyclic relationships**: Does the model allow for *cyclic* connectivity (closed loops, circular feedback/recursion) between the variables, or is the model acyclic.
5. **Type of connectivity**: What is the nature of the connective relationships between variables? For instance, are they mathematical/functional, probabilistic, *quasi-causal or non-causal*? (Ritchey, T., 2012).

On the basis of properties proposed by Tom Ritchey the properties for the model or the modeling method of e.business value of UX design measurement were chosen as shown in Figure 8.

Figure 8. Properties for the model of UX design e-business value measurement

Source: adapted by the author of this study, Ritchey T., 2012, 6-13.

Specification (or variables)	Directionality (or relationships between variabels)	Quantification (of relationships between variables)	Cyclic relationships (between variables)	Type of connectivity (of the relationships between variables)
Specific value range	Directed	Quantified	Cyclic	Causal: mathematical-functional
Non-specific value range („Black boxes“)	Not directed	Non-quantified	Acyclic	Causal: probabilistic
				Quasi-causal (influence)
				Non-causal (E.g. logical/normative

In the model of e-business value of UX design measurement there is no specific value range, the relationships between variables are directed, and acyclical because the model starts with business goal setting and ends at calculating the e-business value of UX design initiatives. The preceding variables have influence to proximate variables therefore the relationships between variables are quasi-causal (influence).

5.2. Analysis of the model

The goal of the model is to enable businesses to measure the e-business value of UX design. As stated in the first chapter of this study, UX design is reffered to designing the end-to-end experience of a certain product, i.e. implementing a set of actions, which should result in a planned change in the behavior of users when interacting with a product. The goal of UX design was also described as designing the users‘ interaction with the aim of satisfying user needs and achieving business goals.

As was stated in the second chapter of this study, measuring value aims at demonstrating that decisions made to implement change have added value to the organisation. It was also stated that business investments including investments in UX design should be made on the premise that the end result would achieve one of the following goals:

1. to increase income or
2. to decrease the costs of delivering a product or a service.

Therefore e-business value of UX design was described as the UX design projects' outcomes of decreased costs and/or increased income. By linking the goals of UX design described in its definition and the goals of UX design investments, the task of measuring the value of UX design was formulated as assessing whether specific user behavior that was stimulated by UX design would lead to decreased costs or increased income.

It is understood that calculating the future value of investments requires assesing many side factors like competence of the staff, resouces, outer threats, technological risks, experience in the field and other. In order to simplify the construct of the model those factors will not be taken into account. For the purpose of creating a UX design e-business value measurement model the *good* UX design will be considered as happening „*in the blackbox*".

It is also necessary to mention that indirect value that was highlighted in the balanced scorecard methodology will not be taken into account in this model. The balanced scorecard method has the aim of demonstrating how all of the business areas are connect through cause-and-effect relations. This way unlike concentrating only on connecting user behavior with financial outcomes, balanced scorecard also takes into account the influence that UX design might have on business processes or innovation / employee competence which has an indirect value to the business. Figure 9 shows the comparison of the scope of this model to the object of BSC – the process and the innovation / employee perspective of the BSC is not taken into account in this model.

Perspective	**User experience strategy**	
Financial	Increase revenue	Reduce costs
Customer	Desired user behavior	Desired user behavior
Process		
Innovation / employee		

Figure 9. Comparison of the scope of the model for measuring e-business value of UX design and the object of BSC

The model will be constructed with the reference to modelling methodology, the theoretical aspects of assessing user experience, the e-business value measurement methods described in the second chapter of this study and the principles of UX design e-business value measurement that where described in the third chapter of this study.

The UX design value measurement model consists of four phases and ten steps that start by setting business objectives and ends by calculating the ROI of UX design initiatives. The model is presented in Figure 10.

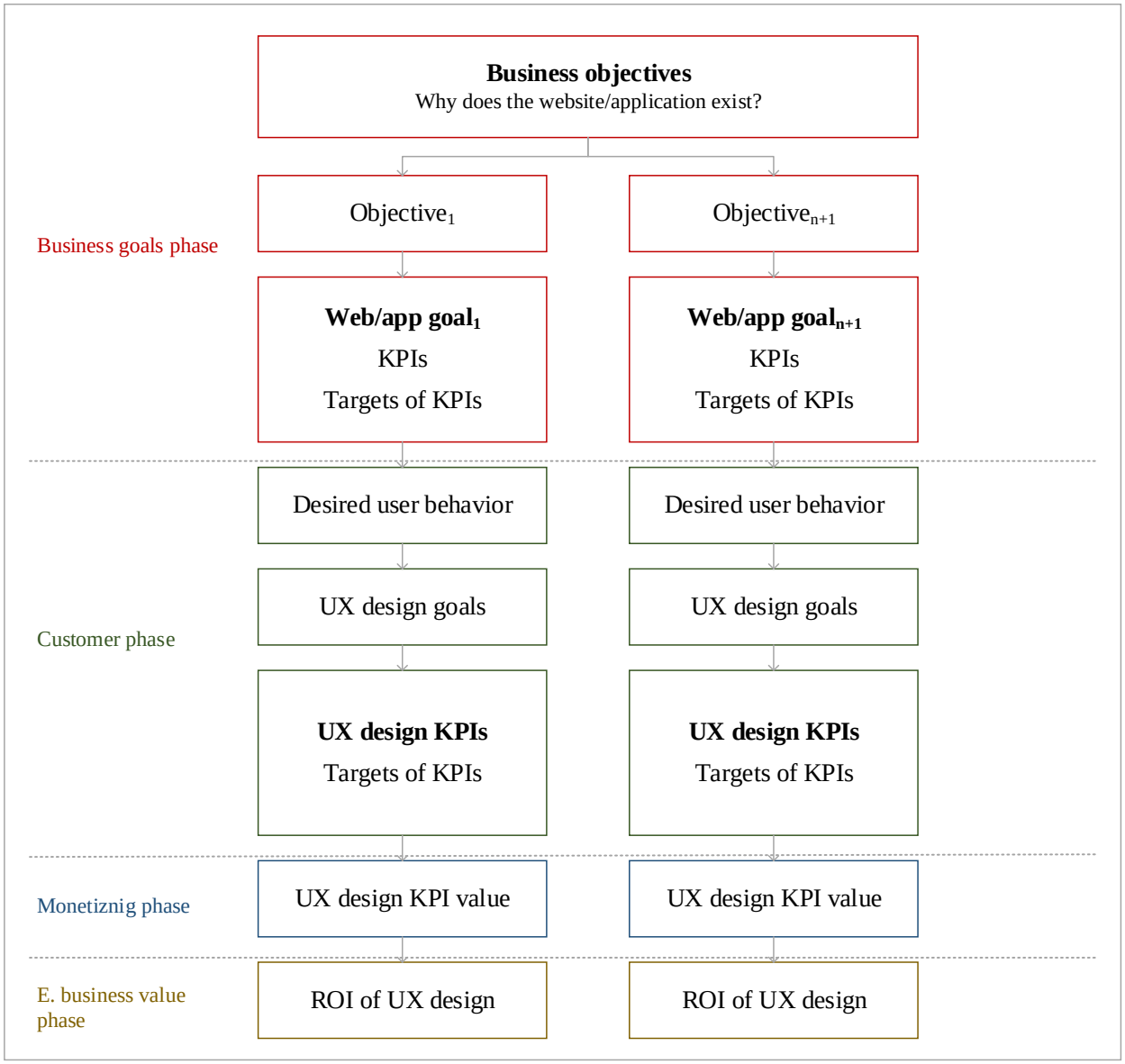

Figure 10. Model for measuring the e-business value of UX design

1. **Business goals phase.** This phase consists of four steps starting with setting the overall e-business objectives.

   1.1. **The e-business objectives** should be defined well beyond website or application goals. They should be tied to overall business strategy or digital product strategy and answer the

question of why the online appearance even exists. As stated in the first chapter of this study, strategy should be a foundation of every user experience that is being created. In a broad sense the e-business objectives should always be tied to one of two objectives: revenue growth or cost reductions. As stated in the first chapter of this study, e-business objectives are tied to business models and revenue streams that companies have chosen. The choice to begin by formulating e-business objectives correlates with the third principle of UX design value measurement: UX activities must be aligned with business and/or product objectives expressed as metrics.

1.2. **The web or application goals** are specific strategies that have to be leveraged to accomplish the e-business objectives. Goals should be created for each e-business objective. If, for example, the e-business objective would be to generate profit, the website goal could be expressed as generating online sales.

1.3. **KPIs** of web/app goals are e-business metrics that help understand how successful the e-business operates against its goals.

1.4. **Targets of KPIs** are numerical values that have to be predetermined as indicators of success or failure. Targets usually come from historical performance.

2. **Customer phase.** This phase consists of four steps that relate to forming and measuring user behavior.

2.1. **Desired user behavior** step depends on the before formulated e-business objectives and web/app goals. In order to start designing UX, one firstly has to determine what user behavior is valuable to the business. As stated in the first chapter of this study, the process of UX design requires UX designers to specify user goals and scenarios of how users will interact with the site or application. User behavior goals very much depend on the e-business model that company employs: be it a media property, transactional e-business, collaboration platform or software-as-a-service. As stated in the second chapter of this paper, it is also important to take into account if the desired behavior is direct, i.e. happens on the website or application and has a direct impact to the bottom line, or indirect, i.e. refer to customers‘ actions that firstly appear on the website or application but the value to the business is created by the behavior, which may have ended elsewhere – on another website or even offline (in a physical store).

2.2. **UX design goals** are build on user behavior goals and inform the team of UX designers what UX design decisions should be implemented. For example, if the user behavior goal was to increase the percentage of overviewed item pages, the UX design goal could be fixing the errors of navigation or changing the site structure and content in a way it promotes viewing the items more often.

2.3. **UX design KPIs** step relates to measuring the user experience. As stated in the first chapter of this study, in order to be able to measure the e-business value of UX, one first needs to assess the UX itself based on objective data and not subjective estimations. UX metrics differs from other metrics in that they always measure something related to user behaviors and attitudes. As was seen in the analysis of UX metrics, one of the most important metric related to formating and measuring user behavior is the conversion rate metric which demonstrates what percentage of users that use a product have performed an action that is of value to the business or what per cent of users achieved a goal that is important to the business.

2.4. **Targets of UX KPIs** is very similar to step 1.4 as UX KPI values should also be predetermined before starting the designing process. It is key to understand the target of the KPI because monetization of this KPI in the later step will ensure an ability to calculate the ROI of UX design.

3. **Monetizing phase** has one step of setting a value or a price tag for the UX design KPIs. This is the step where the goals of forming user behavior are aligned with financial outcome. This step requires to define the financial value metrics related to certain KPIs of UX design or KPIs of user behavior. For example, if target of UX KPI was the increase of conversion rate by 1 per cent, the financial value of that KPI could be calculated according to sales volumes of the company and current conversion rate value. Another example could be a UX KPI of decreasing user error rate in the check-out form by one per cent which may generate additional 10 k. As stated in the customer phase, the monetizing phase should also take into account direct as well as indirect behaviors (those that happen offline).
4. **E-business value phase** is where the ROI of UX design is calculated. The ROI is calculated by dividing net benefits of UX design initiatives by costs of UX design. The benefits could be quite easily calculated having the monetized UX KPIs.

- Theoretical knowledge about the success of any kind of functionality, user interface or design pattern in a specific market or product does not mean that it will suit for another e. business. Therefore the e. business value of UX design must be measured in the context of one‘s own company. Only company-specific business objectives and goals should be the basis of UX design activities. The same goes with the monetization phase as companies should calculate the specific value of the desired behavior of users that are interacting with their websites or applications. It is recommended during the last phase of this model, after the ROI calculations

are made and the business value of UX design is known, to employ other financial methods that would evaluate risk, inflation, the payback period and other factors.

- In practice alongside UX design, many other activities targeted at revenue growth (like sales promotions, pricing strategy changes, communication and other) are implemented at one time. This requires transparent business processes with agreed upon steps, roles and responsibilities in order to calculate the financial value of the actions taken by UX design alone. In practice there is usualy a need of additional features of analytics software in order to capture the cause-and-effect of individual business initiatives.
- Being acyclic the prepared model enables to link e. business goals to UX design activities and financial outcome and thus calculate the ROI of UX design. In practice the model could be also used as an itterative process in order to track progress towards the desired value of UX design. In that case, the model would not only serve as a tool to calculating the ROI of UX, but in case the process was applied correctly, it would also enable managers to evaluate the effectiveness of UX design itself.

CONCLUSIONS

1. User experience as a discipline that encompasses all aspects of the end-user's interaction with an organization, its services, and its products. It is understood that positive user experience increases adoption, retention, loyalty and, ultimately, revenue while poor user experience is one of the main reasons for customers to reject a product. The goal of UX design should be described as designing the users' interaction with the product with the aim of 1) satisfying user needs and 2) achieving business goals. On the basis of the scope of UX, five areas of UX assessment were proposed: supporting user needs, effectiveness and efficiency of user tasks, emotional appeal and engagement, user adoption and retention, planning and forming user behavior. UX metrics were analyzed and categorized according to UX areas they are aimed at assessing: the first group of metrics is related to usability optimization and the second group aims at measuring the success in forming the attitudes ant behavior of users. However, the value of metrics is only seen if they are tied to business goals. In order to consistently pass through the business goals to scenarios of user behavior and metrics to assess it, a structured data-driven UX design process with clear stages that have clear goals was proposed. User behavior goals depend on specifics of particular businesses and some groups of metrics are suitable and necessary for specific e-business models. Depending on e-business models and revenue streams businesses have entirely different expectations for user behavior and thus diverse requirements for UX design activities and UX design metrics. The Media property e-business model that earns revenue through advertising has a main user behavior goal of maximizing the number of users that click on advertisements, the transactional e. busines model which has a revenue stream of e. commerce has two primary user behavior goals of maximizing the number of visitors who make a purchase and maximizing shopping cart size. Meanwhile collaboration platforms has a primary goal of maximizing user engegament and subscription based Software-as-a-service applications rely on maximizing the number of visitors who become subscribers. The secondary goals then relate to those primary goals and the metrics of UX design differ in seperate e-business models.
2. UX is valuable to e-businesses if its benefits exceed invested resources. Business investments including investments in UX design should be made on the premise that the end result of a project would achieve one of the following goals: to increase income or to decrease the costs of delivering a product or a service. Therefore e-business value of UX design is described as the UX design project outcomes of decreased costs and/or increased income. Financial valuation methods theoretically answer the questions whether investments to UX design may be positive and if so, what is the payback period of those investments. But those methods have

a shortage in that they give no clue of how to calculate the benefits or the value part of those investments. Therefore financial methods are necessary but incomplete in calculating the value of UX design. The user experience value chain method adresses this shortage by proposing the principle of tying UX design goals to financial outcome. This method sees UX design as facilitator of user behavior and proposes to monetize that behavior. This way the user experience value chain method partly solves the problem of calculating the net benefits of UX design because the price tag put on behavior allows to know what financial value the formed user behavior brings to the business. The approach of linking user behavior to financial results is similar to the one proposed by balanced scorecard methodology. But in contrast to user experience value chain method, the BSC additionally evaluates the impact UX design has on business processes or innovation. The BSC enables to demonstrate how all of those business areas are connected and what cause-and-effect relations lie behind them. This way unlike concentraining only to user behavior and its financial value, the BSC also shows, for example, how innovative UX design thinking changes digital product development processes, what impact it has on customers and what financial outcome it delivers. This way the balanced scorecard method gives the broadest picture and enables to capture the value of UX design through different perspectives.

3. On the basis of the analysis of UX assessment and the measurement methods of e-business value of UX design, six principles were proposed that should be taken into account in order to measure the value of UX design: value of UX must be measured in the context of one‘s own company, value of UX activities must be measured apart from other business iniciatives, UX activities must be aligned with business and/or product goals expressed as metrics, UX metrics must be used to track progress towards business and/or product goals, UX design must be targetet to forming user behavior, the user behavior that is tied to business goals must be monetized.
4. The results of the qualitative research have shown that respondents indicate difference reasons of why UX design is valuable but all of them express an opinion that value is created by UX design. However, not all of the respondents agreed to an idea that the exact e-business value of UX design could be measured. Those who were sceptical towards measuring the e-business value of UX design state that UX is similar to marketing in a way both are needed to make the products successful but the exact value added of each is unknown. However, four of five respondents believe that measuring the value of UX design is stronly related to analyzing user behavior. Moreover, the answers show unanimous approval that the impact UX design has on user behavior could be measured. This indicates that the methods of calculating the e-business value of UX design are unknown. The generalization of answers also revieled that metrics

related to UX or user behavior are not included in overall list of e-business success metrics. From the answers related to metrics of UX design and metrics of user hehavior, it is seen that little attention is given towards measuring the outcomes and impact of UX design projects. A conclusion could be made that the attention to metrics of user experience design is or could be dependent on the maturity level of overall performance measurement system that a company is employing. The results of the qualitative research have confirmed the idea that a model for measuring the e-business value of UX design is needed.

5. The model for measuring the e-business value of UX design was created. The model links e-business objectives with UX design initiatives and financial outcomes of UX design actions. This way the ROI of UX design is managed to be calculated. The proposed model addresses the thinking of some experts and practitioners that UX design is valuable but the value is difficult or even impossible to be measured. Thus the e. business value of UX design should be measured in the context of one‘s own company and only company-specific business objectives and goals should be the basis of UX design activities. The same goes with the monetization phase as companies should calculate the specific value of the desired behavior of users that are interacting with their websites or applications. After ROI calculations are made and the business value of UX design is known, it is recommended to employ other financial methods that would evaluate risk, inflation, the payback period and other factors.

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SANTRAUKA

Magistro baigiamojo darbo tikslas – sukurti modelį, skirtą įvertinti vartotojo patirties įtaką elektroninio verslo vertei. Tikslas pasiekiamas, atliekant vartotojo patirties matavimo teorinių aspektų analizę, apžvelgiant metodus, skirtus matuoti vartotojo patirties įtaką elektroninio verslo vertei, taip pat atliekant kokybinį vartojo patirties vertės elektroniniam verslui skaičiavimo tyrimą.

Darbe taikyti mokslinės literatūros analizės, dedukcinis, analogijos, apibendrinimo, palyginamasis metodai. Mokslinės literatūros analizės ir dedukcijos metodai naudoti, analizuojant vartotojo patirties matavimo teorinius aspektus ir apžvelgiant metodus, skirtus išmatuoti vartotojo patirties įtaką e-verslo vertei. Apibendrinimo metodas naudotas, išskiriant vartotojo patirties įtakos e. verslui matavimo principus. Palyginamasis ir mokslinės literatūros analizės metodai naudoti aprašant vartotojo patirties elementus, vartotojo patirties dizaino rodiklius, duomenimis grįstą vartotojo patirties dizaino procesą, ryšius tarp e-verslo modelių ir vartotojo patirties dizaino, vartotojo patirties įtakos e. verslo vertei matavimo metodus. Atliktas kokybinis tyrimas, apklausiant e. verslo ir vartotojo patirties dizaino ekspertus. Kokybinio tyrimo tikslas – išsiaiškinti ekspertų nuomonę dėl vartotojų patirties įtakos e. verslo vertei, taip pat jų versle taikomus vartojo patirties matavimo metodus. Kokybinio tyrimo metu naudoti dedukcijos, analizės, analogijos, apibendrinimo ir palyginamieji metodai. Darbo pabaigoje sukurtas modelis, skirtas išmatuoti, kokią vertę e. verslui sukuria vartotojo patirties dizainas.

Darbą sudaro penki skyriai. Pirmajame skyriuje išanalizuoti vartotojo patirties vertinimo teoriniai aspektai: pristatyti vartotojo patirties elementai, vartotojo patirties dizaino tikslai, vartotojo patirties matavimo sritys, aptartos ir tarpusavyje palygintos vartotojo patirties dizaino rodiklių kategorijos, pristatytas duomenimis grįstas vartotojo patirties kūrimo procesas, atskleistas ryšys tarp e. verslo modelių ir vartotojo patirties dizaino tikslų. Antrajame skyriuje apvežglti metodai, skirti vartotojo patirties vertei išmatuoti. Trečiajame skyriuje pristatyti vertės, kurią e. verslui kuria vartotojo patirtis, matavimo principai. Ketvirtajame skyriuje atliktas kokybinis tyrimas. Penktajame skyriuje pristatomas modelis, skirtas įvertinti vartotojo patirties įtaką elektroninio verslo vertei.

Keywords: vartotojų patirties dizainas, vartotojų patirties veiksmingumas, vartotojų patirties vertė, e-verslo vertė, ROI

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SUMMARY

The purpose of the study is to determine a model for measuring the e-business value of UX design. The purpose is achieved by analyzing theoretical aspects of UX assessment, identifying the methods and principles of UX design value measurement, by carying out a qualitative research of UX design value measurement.

The study relies on scientific literature deduction, analysis, analogy, generalization, comparison methods. Scientific literature analysis and deduction methods were used in order to analyze the theoretical aspects of UX assessment and identify the theoretical methods of UX design value measurement. Generalization method was used to distinguish the principles of UX design value measurement. Comparison and analysis methods where used while analyzing the attributes of user experience, the UX metrics, the data-driven UX design process, the links between e-business models and UX design, the methods of UX design value measurement. Qualitative research method has been applied by interviewing e-business and UX design experts. The research was aimed at finding out e-business experts‘ opinion towards measuring the e-business value of UX design and to learn the methods of UX measurement that are applied in their daily practices. Deduction, analysis, analogy, generalization and comparison methods were used in carrying out the qualitative research. A model for measuring the e-business value of UX design was proposed.

The study is composed of five sections. In the first section the theoretical aspects of UX assessment are analized: the attributes of UX, the goals of UX design and areas of UX assessment are distinguished, different categories of UX metrics are analized and compared, the data-driven UX design process and the relation between UX design and e-business models is presented. The second section examines the theoretical aspects of UX design value measurement, six methods of UX design value measuremenet are analyzed. The third section introduces the principles of UX design value measurement. In the fourth section the qualitative research is presented. The fifth section is dedicated to the proposed model of e-business value of UX design measurement.

Keywords: user experience design, user experience performance, user experience value, e-business value, ROI