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Develop an inclusive UX evaluation framework

B2C E-commerce Heuristic Metrics (EHM)

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ABSTRACT

The evolvement of e-commerce with advances in internet-enabled multi-devices, customers can engage in business encounters at any time and place by creating real-time interactions through numerous touch points (Bilgihan et al., 2016). Accordingly, understanding user experience(UX) from the user perspective is a new essential requirement to improve overall customer experience(CX) (Phifer & Valdes, 2016). From this perspective, any professionals who are engaged in an e-commerce business, including designers, marketers, developers, and operators need an exhaustive UX evaluation process. Therefore the study aims to provide a UX evaluation method which can be utilised easily and quickly. To attain this goal, the process starts with an investigation of current factors related to UX evaluation by collecting measurable constructs, attributes and heuristic metrics. And mapping those collated elements to a customer journey(CJ) for demonstrating usefulnesses and defining constraints of the metrics. In conclusion, a result of the process introduces an inclusive evaluation framework: B2C E-Commerce Heuristic Metrics(EHM). Further, afterthoughts of the research inquire possible applications of the UX evaluation to other digital commerce domain for various stakeholders.

1. INTRODUCTION

1-1. Background

[The era of e-commerce service]

According to a report by Deloitte, service business is increasing relative to world GDP and becoming vital in many countries' economic health; the change is significant in a conventional retail industry that their focus has been shifted to online-based services greater than in the past (Kaji et al., 2018). Hence the service for buying and selling goods by using electronic technologies that bring a transaction of value to customers, so-called e-commerce will likely continue to be prolific as more people connect to internet and trade digitally across the world (Gillespie et al., 2018). Moreover, a detailed analysis of Forrester says, e-commerce has been rising as a significant axis of business growth with the \$2.0 trillion of the spent amount in 2017 by consumers (O'Grady, 2018).

Additionally, for retailers, e-commerce platform can provide a lower risk, faster avenue to enter, test, and penetrate international markets (Lobaugh, et al.,2014). Based on an omni-channel strategy report, it is a technology most of the companies; 95% of 256 companies to use and plan to implement today (Forrester, 2014). Notably, among the many retail categories, fashion is the second-largest category after grocery with prospect sales amount of around \$500 billion, and its online penetration rate is roughly twice that of overall retail sales (Meena, 2018).

[UX, the principal business objective]

Today a common usage of internet-enabled devices such as laptops, smartphones, tablets, wearable computing devices allows customers able to access to different channels such as mobile apps, email, social media, SMS, telephone, live chatbot, and others, along with their service usage journey (Flaherty, 2017). Among this situation, e-commerce customers are experiencing dynamic and connected interactions across multiple channels and touchpoints (Forrester, 2014). This circumstance implies that companies who are providing services have more opportunities to reach customers; by expanding much further in distribution chains, and optimising their resources. At the same time, customers are recognising every single detail sensibly and perceiving a service on a usage process as a whole (Lemon & Verhoef, 2016).

Consequently, service providers are required to re-evaluate their service features from a user-centred perspective to fulfil the omni-digital channel user experiences (Bilgihan et al., 2016) (Flaherty, 2017). To date, despite high investments in technology, companies keep confronting challenges to meet the end users' expectations (Forrester, 2014).

1-2. Literature Review

[Definition of UX in the present]

As more products and services are digitised, UX is getting limelight as never before (Law, Roto & Hassenzahl, 2009). It simply means the quality of experience a person has when interacting with a product or service (Knemeyer & Svoboda, 2019). However, its definition has been disputable agenda even for UX communities while its importance is increasing (Revang, 2018). Thereby, it is favourable to call attention to UX terms before moving into the study.

Let's take a look several notable annotations from UX experts. First, Don Norman, the inventor of the word 'User Experience' said – "No product is an island. A product is more than the product. It is a cohesive, integrated set of experiences. Think through all of the stages of a product or service – from initial intentions through final reflections, from the first usage to help, service, and maintenance. Make them all work together seamlessly"(Norman, 2009). A definition by International organisation for standardisation describes UX: "a person's perceptions and responses that result from the use or anticipated use of a product, system or service"(The definition proposed by ISO 9241-110: 2010) (Bevan et al., 2016). Also based on reputable sources selection by Gartner (Revang, 2018), Marc Hassenzahl defines; "UX is a momentary, primarily evaluative feeling (good-bad) while interacting with a product or service"(Hassenzahl, 2008). UX practitioners of nowadays are considering "the entire process of acquiring and integrating a product, system or service and, including aspects of branding, design, usability and function as well as it scopes related human factors such as users' physical limitations to read a text and aware of colours and others"(The Interaction Design Foundation, 2019).

Everything considered this study sets a definition of UX: "A person's cohesive and integrated set of evaluative perceptions and responses while interacting with a product, system or service from initial intentions through final reflections."

[Current status of UX evaluation]

In the past, evaluating human-computer interaction have traditionally carried out focusing on 'Usability' either the software is useable or not (Law, Roto & Hassenzahl, 2009). The notion of usability had born with the history of Human-Computer Interaction (HCI) when PC had spread in the 1980s. However, software design practices were only consider trained specialists. This fact brought constant frustration and consequent anxieties of average users. Thus usability became a pivotal objective to evaluate for designing software. During the 1990s, the attention of HCI shifted from usability to 'Contexts of use'. While new technologies and software systems are expanded in a late century, researchers and practitioners in the field have become well aware of the constraints of the traditional usability framework to measure person's perceptions and responses (Rasu et al., 2015). For this reason, the measurements broadened from pragmatic (easy and efficient) to experiential (delighting, hedonic) (Ketola & Roto, 2009).

This continual evaluation attempts for user experience are including non-utilitarian aspects such as interactions, sensation, and the meaning as well as the value of such contact in everyday life (Law, Roto & Hassenzahl, 2009). Particularly Roto emphasises periods of UX; before - during - after usage and over time by involving the individual and dynamic nature of experiencing emotions during the encountering system (Roto, V. et al., 2011). These models help to measure user experience in real life, preferably after long-term use.

1-3. Motivation

[The benefit of evaluating UX]

An article by UX consultant Jon Innes describes the customers are those who purchase products, while users – who are just visiting or using an e-commerce site – are not yet customers (Innes, 2013). In this way, the reason for evaluating the UX is simple; to contribute to help to improve users' experiences and turn them to customers. A seamless journey with good UX can convert users to customers by eliminating customers' pain points, giving the customer a degree of control, and anticipating customer needs (Kodali 2018). Moreover, the improvements will bring to both tangible and intangible benefits; the former include revenue growth by contributing more purchasing customers and cost reduction by lowering operational mistakes and infrastructure errors; the latter contains increasing market occupancy, improving brand image, and spreading positive word of mouth (Valdes, 2017).

After all, the importance of UX evaluation to e-commerce keeps rising in a competitive digital buying world. In this situation, there are many benchmark metrics are exist, yet it is rare to find a quick and easy UX evaluation tool which emphasise user's living experience. Consequently, there is a significant need for an inclusive evaluation method to decision makers; metrics with UX heuristics potentially add structure to an evaluation process, assist in sharing discovery, and contribute to develop companies' crucial UX strategies by providing insights and information of overall customer experiences. In short, understanding what to measure and how to evaluate service will offer so much more than just simple inspections.

[Process of the study]

This study is a walkthrough process to present what and how to evaluate UX. The main 3 activities included are; first, identify what measurable constructs and attributes. Among the numerous theoretical and empirical researches, seven literature works are selected for backing up. Second, bring out criteria, recommendations and best practices from the industry and matched with each measurable qualities. Third, devise a customer journey to apply measurable attributes and suggestions. After this activity, an inclusive heuristics for an e-commerce UX evaluation is generated.

After the three steps of the process, the resulted heuristic list will involve both approaches from quality metrics and customer journey. One of the unique plans is the study process attempts to integrate existing academic knowledge with the industrial criteria, then apply it in a real-world context. As a whole, the research highlights on discovering a convergence point of among the many floated evaluation approaches to reach a clear resonance of UX evaluation in an e-commerce context.

1-4. Before entering the study

During UX field and its evaluation needs have been growing, new terms have been developed constantly among the communities. Therefore this chapter explains relative terms which based on the literature definitions to provide a clear understanding of the research.

[What is UX Evaluation?]

UX Evaluation refers to an action to assessing a person's perception of the products, service, or system before, during and after interacting with it (Law et al., 2009). Even though UX is subjective, context-dependent, dynamic over time and changes, field researchers and industry professionals keep advancing their ways of measurement by developing and utilising UX evaluation metrics and methods together with the evolution of new technologies (Tullis & Albert, 2013).

[What are UX Evaluation Metrics?]

Commonly 'Metrics' means standards of measurement. In the UX field, it indicates a way of measuring or evaluating personal experiences of the human being using a product, service or system. For example, it helps to demonstrate some aspect of effectiveness (being able to complete a task), efficiency (the amount of effort required to complete the task), or satisfaction (the degree to which the user was happy with his or her experience while performing the task) (Tullis & Albert, 2013).

[What is UX Heuristic?]

One of the mainstream ways of evaluation is utilising heuristic method. It is a problem-solving method that uses shortcuts to produce good-enough solutions given a limited time frame or deadline. Heuristic is a flexible technique for quick decisions, mainly when working with complex data. And the decisions made by using heuristic principals may not necessarily be optimal (Chen, 2019).

This paper presents the manner of use "Heuristics" by following Jakob Nielsen's "10 general principles for interaction design"(Nielsen, 1994). Therefore "Heuristics" signifies a set of heuristic metrics. For instance, Bonastre proposed "Heuristics" specifically for B2C website by combining all the e-commerce principles from the literature and standardise them into interrogative sentences to be ready for evaluators to use (Bonastre & Granollers, 2014).

[What are UX Constructs?]

Construct means concepts or ideas about an object, attribute, or phenomenon that are worthy of measurement in general research context (Constructs, 2012). UX constructs designate certain aspects of user experience that researchers are interested in measuring.

[What are UX Attributes?]

Quality attributes are known as quality factors or quality characteristics within the system engineering context (Chen et al.,2013). In service quality domain, an attribute keeps the original definition as a subordinate concept of a construct. A certain number of attributes constitute a construct to specify measurable quality.

2. RESEARCH METHODOLOGY

2-1. Overview

This chapter presents three steps to deduct a set of heuristic metrics successively. As a starting point, two questions asked to define relative elements (Step1). Next, the collected items are collated with Heuristics (Step2). After all, the consolidated data will be utilised to demonstrate the benefit of the list of Heuristics (Step3). Here the table explains questions and examines the process for each step:

Step 1	What is measurable in UX?	2-2-1. Collect measurable UX constructs
	How to extract essential measurable UX constructs?	2-2-2. Re-organisation of measurable UX quality taxonomy
Result	2-2-3. Result: Comprehensive UX constructs with attributes	
Step 2	How to collate appropriate Heuristics for each attributes from the market?	2-3-1. Collate existing UX Heuristics and assign them under the attributes
Result	2-3-2. Result: Measurable UX attributes and Heuristics	
Step 3	How to start a UX evaluation?	2-4-2. Building a CJ
	How to utilise the Heuristics in evaluation?	2-4-3. Mapping UX attributes on the CJ
	How to prove practicability of the E-commerce Heuristic Metrics (EHM) evaluation?	2-4-4. Mapping in-depth UX Heuristics and apply severity rate
Result	2-4-5. Result: A set of B2C E-commerce Heuristic Metrics	

[Recognition: Challenges and limitation of the study]

The study is focusing on how to launch UX Evaluation by presenting exist evaluation standards. These are the preconditions to be recognised:

- The study purposely covers academically demonstrated knowledge as well as down to earth cases from practitioners for contributing to a real-world context.
- The study does not pursue to develop a new type UX evaluation method. It concentrates on showing the Heuristics with new metrics for B2C e-commerce by showing a process of utilising it in a right point.
- Although the UX evaluation mainly assesses usability issues, this study takes a stance that usability is subsumed of UX (Vermeeren et al., 2010).

- A customer journey which is streamlined with user's living experience has adopted as a tool to show how Heuristics could be useful for an on-site evaluation.
- Choose suitable heuristic principals for a particular evaluation context is an apparent challenge of the study. Therefore experts' review and best practices have been accompanied to validate selected Heuristics.
- The study is highlighting on step by step procedures, yet does not attempt to present in-depth analysis or new development implementation through the UX evaluation results.

2-2. Preparation

2-2-1. Collect measurable UX constructs

As a first step, total seven measurable construct sets are collected especially related e-commerce service (Figure1).

Figure 1. Measurable UX Construct sets (Appendix p.29-36)

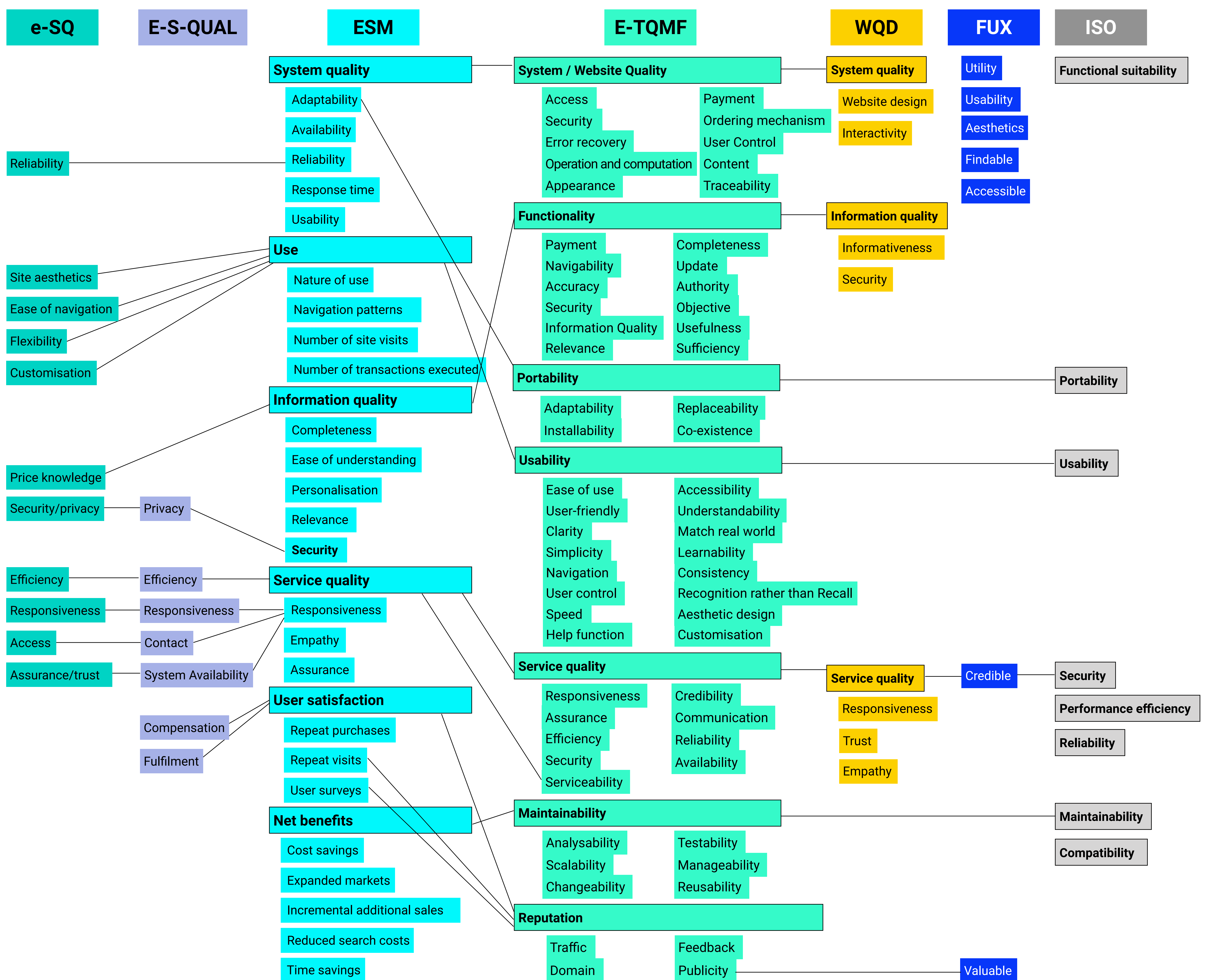
e-SQ	E-S-QUAL	ESM	E-TQMF	WQD	FUX	ISO
Zeithaml et al., 2002	Parasuraman et al., 2005	DeLone & McLean, 2003	Kotian & Meshram, 2017	Lin, 2007	Peter Morville, 2004	ISO/IEC 9126 (ISO/IEC 25010)
Reliability	Efficiency	System quality	Usability	System quality - Website design	Utility	Functional suitability
Responsiveness	System Availability	Information quality	Functionality	System quality - interactivity	Usability	Reliability
Access	Fulfilment	Service quality	Information quality	Information quality - Informativeness	Aesthetics	Usability
Flexibility	Privacy	Use	System website quality	Information quality - security	Findable	Performance efficiency
Ease of navigation	Responsiveness	User satisfaction	Service quality	Service quality - Responsiveness	Accessible	Maintainability
Efficiency	Compensation	Net benefits	Portability	Service quality - trust	Credible	Security
Assurance/trust	Contact	-	Maintainability	Service quality - empathy	Valuable	Portability
Security/privacy	-	-	Reputation	-	-	Compatibility
Price knowledge	-	-	-	-	-	-
Site aesthetics	-	-	-	-	-	-
Customisation/personalisation	-	-	-	-	-	-

- e-SQ (E-Service Quality) and E-S-QUAL (E-Core Service Quality) represent essential online service quality. E-S-QUAL is core metrics of e-SQ, specially E-S-QUAL includes user satisfaction elements (Zeithaml et al., 2002), (Parasuraman et al., 2005).
- ESM (E-commerce Success Metrics) is originated from Information System Success (DeLone & Mclean, 1992). It is more focused on commerce traits of a system (DeLone & McLean, 2003).
- E-TQMF (E-commerce Total Quality Management Framework) takes into consideration quality aspects both from the customer's and quality expert team's side. The essential quality metrics, quality attributes and sub-attributes from both perspectives are measured by using a hierarchical relationship (Kotian & Meshram, 2017).
- WQD (Website Quality Dimensions on Customer satisfaction in the B2C E-commerce Context) is re-assessed model of ESCM, which leads to customer satisfaction variables (Lin, 2007).
- FUX (Facets of User Experience) is conceived to describe the aspect of UX beyond usability (Morville, 2016).
- ISO (International Organization for Standardization) is underlying essential software qualities by addressing several well known human tendencies that can affect delivery and perception of a software development project (ISO/IEC, 2015).

2-2-2. Re-organisation of measurable UX quality taxonomy

Secondly, the study re-organises a taxonomy of UX qualities to extract essential constructs for building a comprehensive UX construct set with attributes. During this process, the research process adopted an Extensional Classification (EC) approach which is a procedure mainly accepted by information system (IS) researchers to present an integrated view of the digital information objects (Gerber et al., 2017). EC applies inductive and empirical classification by carrying taxonomical exercise: grouping constructs premised on given meanings and matching attributes based on each attribute description analysis.

Figure 2. Re-organisation of measurable UX quality taxonomy



e-SQ Zeithaml, Parasuraman, and Malhotra's (2000), 11 e-SQ (e-service quality)

E-S-QUAL Parasuraman, Zeithaml (2005), e-core service quality scale (E-S-QUAL)

ESM DeLone AND McLean, 2003, Table 1. E-Commerce Success Metrics

E-TQMF Kotian, 2007, E-TQMF (E-commerce Total Quality Management Framework)

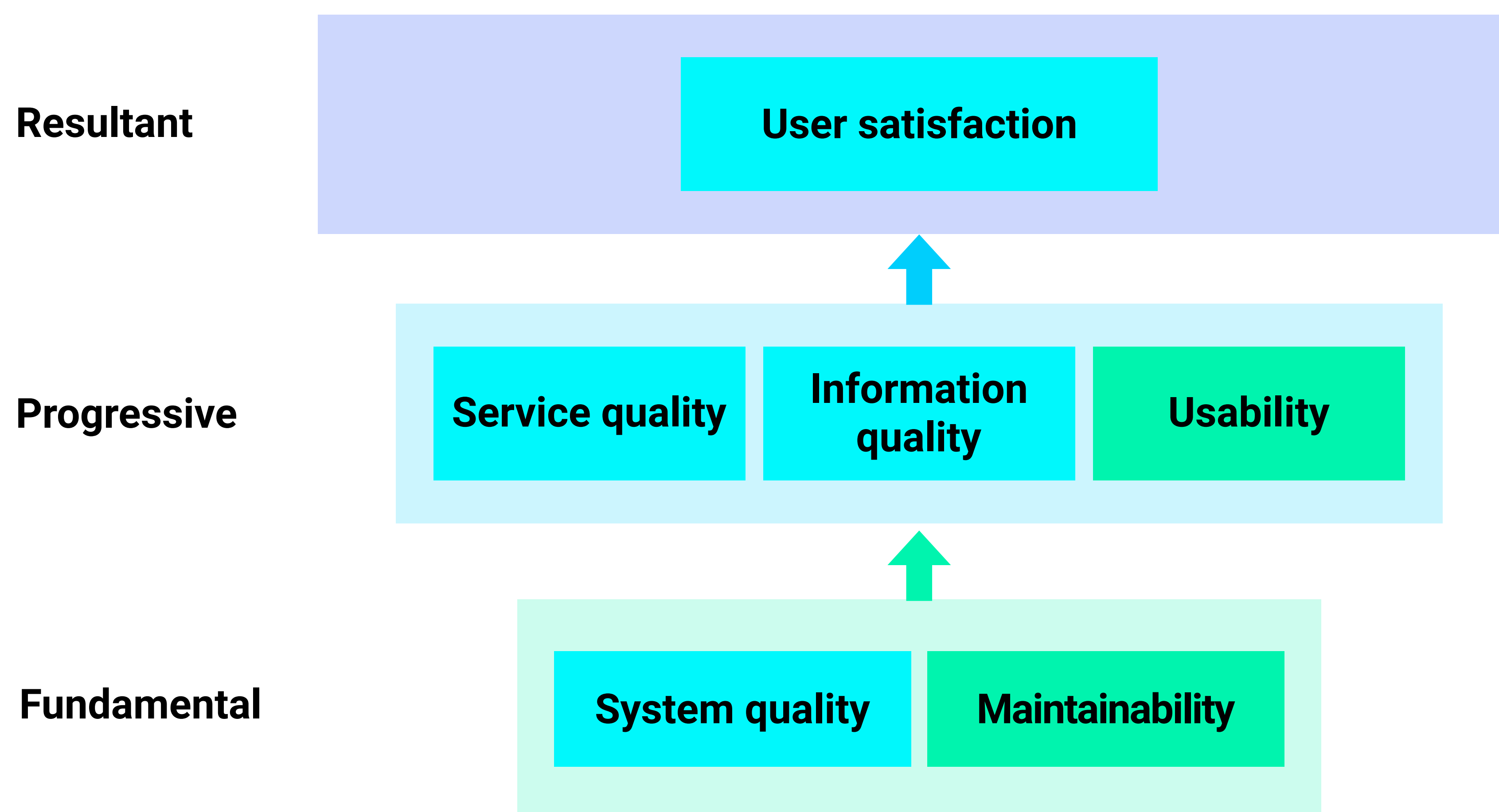
WQD Lin, 2007 The Impact of Website Quality Dimensions on Customer Satisfaction in the B2C E-commerce Context

FUX Peter Morville, 2004, Facets of User Experience

ISO ISO/IEC 9126 (ISO/IEC 25010), International Organisation for Standardisation

The activity divides measurable quality attributes into three types (Figure 3). First, 'fundamental' qualities which are essential qualities for providing fluid experiences. It must be pushed to users via different channels by a service providers' perspective (QA team, developers). Second, the 'progressive' qualities represent attributes relate to the following user involvement. Third, 'resultant' qualities which indicate generated outcome of experiences.

Figure 3. Relationship of constructs



As upon built relationship, a total six of constructs have been pulled out to develop a set of Heuristics for UX evaluation(Figure 4).

Figure 4. Extracted UX constructs

Constructs	Description
SQ (Service quality)	Overall customer evaluations regarding the service delivery of e-commerce and customer support to achieve their shopping goal (Santos, 2003)
INQ (Information quality)	Quality related e-commerce contents in terms of ease, relevance, usefulness, completeness and level of personalisation (DeLone & McLean, 2003)
USB (Usability)	Quality attributes that assess how easy and intuitive user interfaces are to use (NN group, 2012)
SYQ (System quality)	Quality attributes that defined as the infrastructure capability and features in delivering the e-commerce system (Kotian & Meshram, 2017)
MAIN (System Maintainability)	Quality attributes related continuous maintain after specific modification in the system (Kotian & Meshram, 2017)
UAS (User awareness & satisfaction)	Measurable attributes that resulted from the activities of customers, suppliers, employees, organisations, markets, and industries. It represents positive or negative impacts which cover the entire customer experience cycle. Also include determined impacts by context and business objectives for each e-commerce investment (DeLone and McLean, 2003).

2-2-3. Result: Comprehensive UX constructs with attributes

Based on the selected measurable constructs (Figure 4), relative attributes are classified under each of them (Figure 5). In this phase, there is a need to make sure that each attribute term is diversified. It is an unavoidable consequence since there is an inequality between each researcher's taxonomy. Few traits are connotative, and other few are intuitive. Also, some attribute terms are overlapped although it indicates different meaning under a different construct. For example, ESCM's 'Reliability' term is under SYQ. Instead, E-TQMF's 'Reliability' is under SQ. In this case, the term is disposed to follow E-TQMF's classification since it is the most specified construct set. After all, a total of 58 quality attributes are indexed. SQ, INQ, SYQ, and MAIN have kept original attribute terms from literature. USB is listed with renamed attributes based on its speciality that focuses on an interaction on an interface. Here are the main changes explained:

- 'Ease of purchase' grouped with qualities specifically related shoppers' purchasing process.
- 'Social presence' newly joined based on research that it is one of the attributes to assess user trust level (Gefen & Straub, 2004).
- 'Responsiveness' list includes attribute mainly related cross devices and channels. Since the percentage of mobile users are growing everyday, the attribute has been added to bind essential checkpoints.
- UAS terms are mostly renamed by technical terms which have been used commonly in the market (Swerdlow, 2017). This construct is highly changeable depend on a company's performance index. Nonetheless, the study takes the most general metrics which should remain positive in any case.

Figure 5. Comprehensive UX constructs with attributes

Constructs		Attributes	Description
SQ (Service quality)	1	Serviceability	Ability related to troubleshooting
	2	Response capability	Ability to respond to users' requirements quickly
	3	Safety assurance	Ability to ensure task performance in a safe manner
	4	Reliability	Ability to provide dependable and trustworthy customer services
	5	Communication ability	Ability to deliver caring and individualized attention to users
INQ (Information quality)	6	Objective	Objective and unbiased contents
	7	Frequency	Renew contents regularly
	8	Beneficial	Usefulness of contents
	9	Exhaustive	Completeness of contents
	10	Sufficient	Enough amount of contents
	11	Credible	Believable contents, especially give the user confidence to actions
	12	Suitability	Quality to provide relevant information
	13	Match the real world	Ability to present users' language, and concepts familiar to them

Constructs		Attributes	Description
USB (Usability)	14	Ease of use	Simple, flexible, and manageable qualities to operate within the user interface
	15	Ease of purchase	Specific qualities of the user interface to help users pay quickly and easily
	16	Ease of navigation	Capability that allows users to find what they need easily within their movement
	17	Ease of understanding	Specific qualities allow users to understand functions and required actions clearly
	18	Speed	Quick response time within the user interface
	19	Learnability	Ease users' effort for learning the system
	20	Recognisability	Specific qualities allow to 'Recognise rather than Recall'
	21	Consistency	Make the consistent visual elements throughout the site
	22	Aesthetic	Make the website visuals appealing
	23	User Accessibility	Make the site accessible for all users
	24	Social presence	Specific qualities to increase interaction with social channels
	25	Responsiveness (cross devices and channels)	Capability to respond cross-devices or browsers
SYQ (System quality)	26	Accessible	Capability to access to the system at all times
	27	Availability	Capability to run the system at the time when users need it
	28	Immediacy	Capability to update data from users' activities across the devices
	29	Deliverability	Capability to provide multimedia sources that match users expectations
	30	Administrable	Capability to manage orders, stocks, and sales within the ordering mechanism
	31	Efficiency	Capability to perform appropriate relative to actions by users
	32	Error recovery	Capability to help error recovery
	33	Operability	Capability to operate selling products from register to publish, less manual work
	34	User manipulation	Capability to provide user control for save, update, and remove the data
	35	Traceability	Capability to verify the correctness of data processing on required points
	36	Payment	Capability to provide secure and easy payment methods
	37	Accuracy	Capability to yield accurate information
	38	Security	Capability to keep the service secure from intrusion and protect personal information
	39	Adaptability	Capability to adapt to different environments
	40	Installability	Capability to install the software in a specified environment
	41	Replaceability	Capability to replace software components easily within a specified environment
	42	Co-existency	Capability to co-exist with other independent software in a common environment sharing common resources

Constructs		Attributes	Description
MAIN (System Maintainability)	43	Analysability	Enable to diagnose deficiencies, causes of failures, or to identify parts to be modified
	44	Scalability	Enable to meet rising demands of users and usage (i.e., apply new accessibility features)
	45	Changeability	Enable to modification, remove the fault, or to change the environment
	46	Testability	Able to validate the modified software
	47	Manageability	Enable to re-establish software running status
	48	Reusability	Enable to provide the complete or partial reuse in another software product
UAS (User awareness & satisfaction)	49	Conversion rate (task, order, transaction)	Assesses the percentage of website visitors who complete the purchasing
	50	Click-through rate (email, search)	Assesses the productivity of marketing programs
	51	Cart abandonment rate	Assesses the percentage of users who add products on the cart but do not complete the checkout process
	52	Traffic (page views, average session duration)	Assesses the percentage of visiting users' activities and time spent across various devices
	53	Bounce rate	Assesses the percentage of users who land on a page but leave without activities
	54	Repeat purchases rate	Assesses the percentage of return user purchase
	55	Revenue	Assesses the growth of sales
	56	Social media engagement	Assesses user reaction on social media channels (Like, share, comment, share)
	57	Feedback (review)	Assesses user reactions and publicity
	58	App downloads	Assesses the number of App downloads

2-3. Build a Heuristics set

2-3-1. Collate existing UX Heuristics

As a next step, the study will present exist Heuristics to fulfil quality attributes. All collected heuristic items are derived from the existing materials which tested and demonstrated in academic fields or from the industrial sources which based on market trends, case studies, best practices, reports, articles and interviews (Figure 6).

Figure 6. UX Heuristics resources

Category	Reference
Research literature	A Set Of Heuristics for User Experience Evaluation in E-commerce Websites (Bonastre & Granollers, 2014)
UX Communities	Nielsen Norman Group
	Interaction Design Foundation
Market sources	Google UX Playbook for Retail
	Inflow eCommerce Best-in-Class Research Study 2019
	Forrester 'The Retail eCommerce Metrics That Matter'
	How to Improve Your Ecommerce Store's User Experience (and Pay Less to Sell More)
	Why and How to Improve Ecommerce Website Accessibility
	12 Ways to Improve Ecommerce Site Performance & Speed for 2X Conversions
	eCommerce UX – Essential Design Strategies and Principles
	How Personalization Can Reduce Ecommerce Bounce Rates by 20-30%
33 Ecommerce Conversion Rate Optimization Steps Guaranteed to Increase Sales in 2019	

2-3-2. Measurable UX attributes and Heuristics

Based on general academic recognition, an original intention of setting Heuristics in any evaluation context is to examine interactions based on user-centred design rules (Bonastre& Granollers, 2014). Accordingly, the examination is merely eligible to assess the 'progressive qualities' (Figure. 3) which are related to direct contact between users and service. For this reason, all heuristic principals are assigned under SQ, INQ, and USB.

Another necessary process is organising a format of each heuristic's sentence. Since it is a massive gathering of resources, different tones of voice are exist. Thus the study systemised questioning sentences by adopting a construct itself as an object of the sentence (Figure 7). For instance, INQ interrogatives treat 'Information' as an object to achieve; the question can be 'Does e-commerce provide up to date information?'

Figure 7. Preview of UX attributes and obtained Heuristics (Appendix p.38-39)

Constructs	Attributes	Code	Heuristics
SQ (Service quality)	Serviceability	SQ 1	Does e-commerce have customer support methods?
		SQ 2	Does e-commerce have a FAQ section that covers common customer questions?
		SQ 3	Does e-commerce have guidelines to support specific users tasks?
		SQ 4	Does e-commerce have specified contact points for each type of concern?
	Response capability	SQ 5	Does e-commerce respond to users instantly?
		SQ 6	Does e-commerce provide real-time communication tool?
	Safety assurance	SQ 7	Does e-commerce privacy policy visible within the signup process?
		SQ 8	Does e-commerce have signs of customer-trust payment options?
	Reliability	SQ 9	Does e-commerce allow return or refund for the wrong purchase or damaged products?
		SQ 10	Does e-commerce able to return or refund in expected date?
	Communication ability	SQ 11	Does e-commerce have personalised service answer for providing personal information?
		SQ 12	Does e-commerce promote new products or special offers?
INQ (Information quality)	Objective	INQ 13	Does e-commerce provide product attribute information?
		INQ 14	Does e-commerce publish up to date information?
	Frequency	INQ 15	Does e-commerce publish new products or related contents regularly?
	Beneficial	INQ 16	Does e-commerce provide value-added information?
		INQ 17	Is there an additional category that features specific information?
	Exhaustive	INQ 18	Does e-commerce provide comprehensive product information?
	Sufficient	INQ 19	Is there enough information related to products?
		INQ 20	Is the information about the products accurate, informative and convincing?
	Credible	INQ 21	Is there clear information about estimated arrival or ship date?
		INQ 22	Is the information about the refund clear enough?

Additionally, the evaluation requires a rating system for applying its insights to an actual situation. Therefore the study adopted 'Severity Ratings' (Nielsen, 1994). In reality, a quick assessment can be accomplished with 'Yes' or 'No' answers. However, the rating system can help out to prioritise issues based on weight. It could cover each evaluator's consideration, including frequency, impact level, and constancy of problems. Evaluators must interpret the severity rating system not only in the context of 'Fixing Usability' as also consider 'Improving user experiences' as an ultimate purpose of evaluation. Find the revised description of Nielsen's Severity Rating scales below.

Figure 8. Revised severity rating scales

Ratings	Description
0	I don't agree that this is a problem at all
1	Cosmetic problem
2	Minor problem
3	Major problem
4	Critical

2-4. Demonstrate the benefit of the research

2-4-1. How to start a UX evaluation?

In this chapter, the study attempts to prove how heuristic approach can contribute to a field-level problem by inspecting an end-to-end process that a customer goes through to complete a task over time; what is called customer journey (Kim, 2016).

A customer journey will bring evaluation operation further close to reveal factual problems of customers although Heuristics can be applied while evaluators using the service. It is considered among the experts as one of the UX research techniques as well as a fundamental approach for achieving user-centred design (Lemon and Verhoef, 2016). In this case, it is especially useful to unfold all interactions and involved UX qualities alongside the purchasing phases (Kim, 2019). After all, it enables to grasp fragmented relation quickly based on a rate under each question.

2-4-2. Building a CJ

In reality, customers rarely act and think in just one way. Also, it is impracticable to describe everything related to users' experiences such as emotional, subjective and temporal aspects, depend on each person (Lallemand, 2015). Therefore it is crucial to recognise limitations and set the appropriate hypothesis (Costa, 2017). Above all, CJ requires a designated persona who can represent specific end-user according to behaviour types. In this process, an interview conducted with a business manager who engaged in an online retail business to form a particular CJ and its persona.

Moreover, all elements of the journey have been elicited from exist researches or published resources from the relevant industry (Appendix p.41-42). Based on this groundwork, these are the central hypothesis of the CJ:

- The chosen business category is business-to-consumer (B2C) e-commerce platform for apparel & accessory products. Name of the business is E-com.
- The served persona is 20s-40s female who is working. The imaginary target presents a behavioural type 'The humanistic' and this persona reflects emotional and slow paced user scenario (ThinkwithGoogle, 2019).
- The chosen marketing service channels are limited, and the journey is more focusing on digital touchpoints.

Figure 9. Persona detail

Category	Reference
Profile	<ul style="list-style-type: none"> Name: Camila Teisbaek Age: 35 Status: Married, 1 daughter Job: Consultant Phone: iPhone XS
Behavioural	<ul style="list-style-type: none"> Frequently check the SNS apps Collect favourable images on her phone Bookmark pages for the next visit Share inspirations actively on her SNS Read reviews of the products
Goals	<ul style="list-style-type: none"> To buy products with proven quality To shop efficiently To get the best deal To discover new items
Frustration	<ul style="list-style-type: none"> Hard to check item details such as materials, sizes or fit on the website No time to shop on the physical store If the return or refund is necessary, it is hard to manage the process

The CJ has been developed based on the hypothesis previously described with total 5 phases; Initiate (awareness), Connect (Discover & Consideration), Transact (Decision, Purchase), Service (Delivery & Use), and Engage (Loyalty & Advocacy). A female persona's scenario combined with the collected elements which contain the persona's actions, touchpoints and emotions. Like the following steps, UX constructs and attributes will be mapped on the journey.

Figure 10. Preview of the CJ (Appendix p.43)

Consumer Journey	Initiate (Awareness)			Connect (Discover & Consideration)							
Steps	1	2	3	4	5	6	7	8	9	10	11
Stage type	Habitual actions	Unintentional discovery Get information	Add information to a personal list	Initial intentional visit	Welcomed	Provide personal information	Add and archive contents in personal space	Receive automated message	Provide personal information	Check personal information	Exploration
Details	She uses Instagram regularly for checking the latest trends. Follow fashion influencers which suit her style.	Oneday, find a nice image of fashion influencer with E-com tag on a bag.	Visit the E-com Instagram account and follow it.	Access to the E-com online store via Instagram link.	Email opt-in geared popup with 'register your email to get a newsletter and get 10% discount code.'	She ignores the popup and spends some time on the product feed.	Remembers the bag from Instagram and click the LIKE button.	In response, 'Do not lose your favourite items' popup shows with 'Register' button.	Click the 'Register' button and move to the signup page. And Register email, password and address.	Save the info then switch to 'My account' page. She checks the wishlist and makes sure the liked item is saved.	Back to New products menu and explore more items in a different category.
Main actions (Interactions)	- Searching - Subscribing	- Navigating	- Subscribing	- Navigating	- Reading	- Navigating	- Archiving	- Confirming	- Filling info	- Confirming	- Navigating - Searching
Channel	Social Media	Social Media	Social Media	Webapp	Webapp	Webapp	Website	Website	Website	Website	Website
Channel transition			o			o					
Touchpoints - Push (Company side)	- Words of mouth	- Social media content	- Social media account	-	- Instore popup (marketing)	-	- Instore popup (marketing)	- CRM (customer data)	- Instore popup (marketing)	-	-
Touchpoints - Pull (Customer side)	- Social media feed	- Social media feed	-	- Online store FE	-	- Product images catalogue	- Wishlist	-	- Signup page	- My page - Wishlist	- Product images catalogue
Emotions Positive	-	Curious	Attracted	Curious	-	-	Inspired	Motivated	-	Fulfilled	Motivated
Emotions Negative	-	-	-	Confused	Annoyed	-	-	-	-	-	-

2-4-3. Mapping UX constructs on the CJ

By assigning UX constructs to CJ, it is possible to confirm which measurable qualities are pertained to which journey steps.

Figure 11. Preview of UX attributes on the CJ (Appendix p.43)

Consumer Journey	Initiate (Awareness)			Connect (Discover & Consideration)								
Steps	1	2	3	4	5	6	7	8	9	10	11	
Stage type	Habitual actions	Unintentional discovery Get information	Add information to a personal list	Initial intentional visit	Welcomed	Provide personal information	Add and archive contents in personal space	Receive automated message	Provide personal information	Check personal information	Exploration	
Details	She uses Instagram regularly for checking the latest trends. Follow fashion influencers which suit her style.		Oneday, find a nice image of fashion influencer with E-com tag on a bag.	Visit the E-com Instagram account and follow it.	Access to the E-com online store via Instagram link.	Email opt-in geared popup with 'register your email to get a newsletter and get 10% discount code.'	She ignores the popup and spends some time on the product feed.	Remembers the bag from Instagram and click the LIKE button.	In response, 'Do not lose your favourite items' popup shows with 'Register' button.	Click the 'Register' button and move to the signup page. And Register email, password and address.	Save the info then switch to 'My account' page. She checks the wishlist and makes sure the liked item is saved.	Back to New products menu and explore more items in a different category.
Main actions (Interactions)	- Searching - Subscribing	- Navigating	- Subscribing	- Navigating	- Reading	- Navigating	- Archiving	- Confirming	- Filling info	- Confirming	- Navigating - Searching	
Channel	Social Media	Social Media	Social Media	Webapp	Webapp	Webapp	Website	Website	Website	Website	Website	
Channel transition			o			o						
Touchpoints - Push (Company side)	- Words of mouth	- Social media content	- Social media account		- Instore popup (marketing)		- Instore popup (marketing)	- CRM (customer data)	- Instore popup (marketing)			
Touchpoints - Pull (Customer side)	- Social media feed	- Social media feed	-	- Online store FE	-	- Product images catalogue	- Wishlist		- Signup page	- My page - Wishlist	- Product images catalogue	
Emotions Positive	-	Curious	Attracted	Curious	-	-	Inspired	Motivated		Fulfilled	Motivated	
Emotions Negative	-	-	-	Confused	Annoyed	-	-	-	-	-	-	
Constructs_Fundamental	-	SYQ	SYQ	SYQ	SYQ	SYQ	SYQ	SYQ	SYQ	SYQ	SYQ	
Attributes_Fundamental	-	Deliverability	Accessible	Accessible	Immediacy	Deliverability	User manipulation	Immediacy	Administrable	User manipulation	Deliverability	
Constructs_Progressive	-	INQ	INQ, USB	USB	SQ, INQ	SQ, INQ, USB	USB	INQ, USB	SQ, USB	USB	INQ, USB	
Attributes_Progressive	-	INQ_Frequency	INQ_Objective	USB_Aesthetic USB_Speed	SQ_Communication ability INQ_Beneficial	USB_Ease of use USB_Ease of navigation USB_Speed	USB_Recognizability	INQ_Suitability USB_Ease of use USB_Ease of understanding	SQ_Safety assurance USB_Ease of use	USB_Ease of understanding	INQ_Frequency USB_Ease of navigation	
Constructs_Resultant	-	UAS	UAS	UAS	UAS	UAS	UAS	UAS	UAS	UAS	UAS	
Attributes_Resultant	-	Conversion rate (task, order, transaction)	Traffic (page views, average session duration)	Bounce rate	Click-through rate (email, search)	Conversion rate (task, order, transaction)	Traffic (page views, average session duration)	Conversion rate (task, order, transaction)	Conversion rate (task, order, transaction)	Conversion rate (task, order, transaction)	Traffic (page views, average session duration)	

Mapping result shows the overall view of each attribute and the phase that is related. From this perspective, there are the several insights that the activity has shown.

- All the phase includes the Fundamental qualities and the Resultant qualities except Initiate phase.
- The Initiate phase requires primarily the ING qualities to acquire more users and USB qualities for the users who switch the channels back and forth.
- In the Connect phase, INQ and USB mainly impact on a user's experience. A user's main activities are navigation and information acquisition, therefore 'Ease of use' and 'Ease of navigation' take large portion. Among the USAT, 'Bounce rate' and the 'Conversion rate' should be observed meticulously. An example of an action can be 10% coupon grant for email registering users.
- The USB is the most substantial part of quality metrics on the Transact phase. It enables users to have seamless experience until the end of purchase. Also, SQ should back up to guide users with proper support (Responsiveness, Assurance, Safety, Reliability).
- The Delivery phase mainly includes SQ and INQ. Those qualities are related to proper information and support after the delivery of the product. If users have complaints, the service should correspond quickly. The USAT can be evaluated in 'Feedback' and 'Repeat purchases rate'.
- In the Engage phase, INQ is the most important to keep user retention. USAT represents the level of involvement of users to the service after a cycle of the purchase. For example, user satisfaction can be demonstrated with 'Social media engagement'.

2-4-4. Mapping in-depth UX Heuristics and apply severity rate

Again, the premise of mapping is demonstrating how UX attributes and Heuristics can bring market impacts. Since all the problems cannot be solved in at a time, the study recommends to collect rates from multiple evaluators and add subsets of each service problem to facilitate prioritisation and decision-making.

Figure 12. Preview of UX Heuristics and severity rate (Appendix p.43)

Consumer Journey	Initiate (Awareness)			Connect (Discover & Consideration)							
Steps	1	2	3	4	5	6	7	8	9	10	11
Stage type	Habitual actions	Unintentional discovery Get information	Add information to a personal list	Initial intentional visit	Welcomed	Provide personal information	Add and archive contents in personal space	Receive automated message	Provide personal information	Check personal information	Exploration
Details	She uses Instagram regularly for checking the latest trends. Follow fashion influencers which suit her style.	Oneday, find a nice image of fashion influencer with E-com tag on a bag.	Visit the E-com Instagram account and follow it.	Access to the E-com online store via Instagram link.	Email opt-in geared popup with 'register your email to get a newsletter and get 10% discount code.'	She ignores the popup and spends some time on the product feed.	Remembers the bag from Instagram and click the LIKE button.	In response, 'Do not lose your favourite items' popup shows with 'Register' button.	Click the 'Register' button and move to the signup page. And Register email, password and address.	Save the info then switch to 'My account' page. She checks the wishlist and makes sure the liked item is saved.	Back to New products menu and explore more items in a different category.
Main actions (Interactions)	- Searching - Subscribing	- Navigating	- Subscribing	- Navigating	- Reading	- Navigating	- Archiving	- Confirming	- Filling info	- Confirming	- Navigating - Searching
Channel	Social Media	Social Media	Social Media	Webapp	Webapp	Webapp	Website	Website	Website	Website	Website
Channel transition			o			o					
Touchpoints - Push (Company side)	- Words of mouth	- Social media content	- Social media account	-	- Instore popup (marketing)	-	- Instore popup (marketing)	- CRM (customer data)	- Instore popup (marketing)	-	-
Touchpoints - Pull (Customer side)	- Social media feed	- Social media feed	-	- Online store FE	-	- Product images catalogue	- Wishlist	-	- Signup page	- My page - Wishlist	- Product images catalogue
Emotions Positive	-	Curious	Attracted	Curious	-	-	Inspired	Motivated	-	Fulfilled	Motivated
Emotions Negative	-	-	-	Confused	Annoyed	-	-	-	-	-	-
Constructs_Fundamental	-	SYQ	SYQ	SYQ	SYQ	SYQ	SYQ	SYQ	SYQ	SYQ	SYQ
Attributes_Fundamental	-	Deliverability	Accessible	Accessible	Immediacy	Deliverability	User manipulation	Immediacy	Administrable	User manipulation	Deliverability
Constructs_Progressive	-	INQ	INQ, USB	USB	SQ, INQ	SQ, INQ, USB	USB	INQ, USB	SQ, USB	USB	INQ, USB
Attributes_Progressive	-	INQ_Frequency	INQ_Objective	USB_Aesthetic USB_Speed	SQ_Communication ability INQ_Beneficial	USB_Ease of use USB_Ease of navigation USB_Speed	USB_Recognizability	INQ_Suitability USB_Ease of use USB_Ease of understanding	SQ_Safety assurance USB_Ease of use	USB_Ease of understanding	INQ_Frequency USB_Ease of navigation
Constructs_Resultant	-	UAS	UAS	UAS	UAS	UAS	UAS	UAS	UAS	UAS	UAS
Attributes_Resultant	-	Conversion rate (task, order, transaction)	Traffic (page views, average session duration)	Bounce rate	Click-through rate (email, search)	Conversion rate (task, order, transaction)	Traffic (page views, average session duration)	Conversion rate (task, order, transaction)	Conversion rate (task, order, transaction)	Conversion rate (task, order, transaction)	Traffic (page views, average session duration)
Heuristics	-	INQ_15_Does e-commerce publish new products or related contents regularly?	INQ_14_Does e-commerce publish up to date information?	USB_47_Does navigation elements visible enough throughout the related sections?	SQ_11_Does e-commerce have personalised service answer for providing personal information?	USB_31_Does search function allow to refine the search result?	USB_59_Does the website have specific actions, instructions and options to minimize memory load?	INQ_24_Is there any benefit in return for user actions?	SQ_7_Does e-commerce privacy policy visible within signup process?	USB_51_Do menu or categories use a clear user-logical hierarchy?	Does e-commerce publish new products or related contents regularly?
Heuristics	-	-	-	-	-	USB_46_Does navigation operation easy and intuitive?	-	USB_37_Do popups appear at the proper moment?	USB_35_Does social sign up available and convenient?	-	USB_46_Does navigation operation easy and intuitive?
Heuristics	-	-	-	-	-	USB_57_Do multimedia sources load quickly?	-	USB_53_Do CTAs button visible?	USB_44_Do info input fields are minimised?	-	-
Severity Ratings	-	0	0	2	2	1-0-4	2	0-0-0	0-3-0	1	0-0

Each action can accommodate multiple qualities and Heuristics. In the end, the process can attain the quality level of each touchpoint and critical conversion points. It means evaluators can see in a comprehensive way which part has an obvious UX issue. If the rating result is '4', it means the user phase should be examined and fixed as soon as possible. For instance, E-com site is unable to load contents in the corresponding speed of user's scrolling action (CJ step 6), and an evaluator estimates it with severity '4'. The agreeable problem from the assessment is that E-com users are forced to wait without user experience to speak to them because of the site speed is slow; which gives a negative first impression of a digital touchpoint and will interrupt to attract novel users and maintain re-visitors.

2-4-5. A set of B2C E-commerce Heuristic Metrics (EHM)

After the demonstration process, the study proved that the constructs and attributes are concrete. It means they can be used iteratively within any of e-commerce context. Instead, the Heuristics potentially need supplementary guidelines based on target users and digital retail trends. Therefore the final list of evaluation Heuristics will accompany best practices from the market to help evaluators.

Figure 13. Preview of B2C EHM and best practices (Appendix p.44-48)

Constructs	Attributes	Code	Heuristics	Best practices
SQ (Service quality)	Serviceability	SQ 1	Does e-commerce have customer support methods?	- Customer service phone number, tap to call, live chat, and so on. available on Homepage and Product Pages - Provide an obvious and simple customer support method
		SQ 2	Does e-commerce have a FAQ section that covers common customer questions?	convention
		SQ 3	Does e-commerce have guidelines to support specific users tasks?	convention
		SQ 4	Does e-commerce have specified contact points for each type of concern?	- Provide contacts to meet the best for each type of question. (i.e., the question about return and refund)
	Response capability	SQ 5	Does e-commerce respond to users instantly?	- Answer back to call or email quickly as soon as possible - Allow to users to book the support appointment
		SQ 6	Does e-commerce provide realtime communication tool?	- Chatbot with intelligent agents that can assist the customer immediately - Answers back to inquiries via an official account of social network (Facebook, Instagram)
	Safety assurance	SQ 7	Does e-commerce privacy policy visible within signup process?	convention
		SQ 8	Does e-commerce have signs of customer-trust payment options?	- Show small images of credit cards, PayPal and other payment options - Display security badges (McAfee, GeoTrust, and so on)
	Reliability	SQ 9	Does e-commerce allow return or refund for the wrong purchase or damaged products?	convention
		SQ 10	Does e-commerce able to return or refund in expected date?	convention
	Communication ability	SQ 11	Does e-commerce have personalised service answer for providing personal information?	- Send a confirmation email and link for order tracking
		SQ 12	Does e-commerce promote new products or special offers?	- Show global promotion area or promotion banners stick on the top or bottom when scrolling
INQ (Information quality)	Objective	INQ 13	Does e-commerce provide product attribute information?	- Present product facts include materials, finish, and size with measurement guide
		INQ 14	Does e-commerce publish up to date information?	- Make the price they are seeing is the current sale price
	Frequency	INQ 15	Does e-commerce publish new products or related contents regularly?	convention
		INQ 16	Does e-commerce provide value-added information?	- Product flags with occasional labels such as new, on sale, etc. - Repeat the main value proposition such as free shipping, free returns, or next day delivery - Add urgency elements on the products (quantity, time or seasonal limitation)
	Exhaustive	INQ 17	Is there an additional category that features a specific information?	- Themed navigation options are available such as Shop by Style or Curated Collections besides standard categories
		INQ 18	Does e-commerce provide comprehensive product information?	- Show summary page before the checkout including all the list of products, prices, taxes, and shipping
	Sufficient	INQ 19	Is there enough information related to products?	- Display the product images from several angles and include close-ups
		INQ 20	Is the information about the products accurate, informative and convincing?	convention
	Credible	INQ 21	Is there clear information of estimated arrival or ship date?	- Provide expected on the product page or check out page
		INQ 22	Is the information about the refund clear enough?	- Provide the shipping, refund or exchange policy and other shop rules - Provide the separated section to claim refund or exchange the product

3. Concluding thoughts

To recap the starting point of the study; even though everyday needs of evaluating UX as a part of the job are growing for practitioners, there is lack of assessment method which is easy for iterative usage without needs of equipment or specific software. From this back story, the research challenges the current status by proposing an evaluation way which can be beneficial to on-site situation. A unique contribution of the study is suggesting a universal language that multiple evaluators can speak and discuss together. It is a norm that any collaborative work can be hindered without a shared language. Hence, it is definite that standardised UX heuristic metrics can be beneficial to different stakeholders; UX designers, engineers, marketers, or business planners.

The research process exhibits every step of evaluation from a taxonomy formulation to its application. It reveals that evaluators can unfold all elements of the customer journey and inspect the insufficiency of e-commerce service; by casting light on different phases in a service lifecycle to show the quality of a system or afterwards impact. Additionally, the process also discloses that a framework of an evaluation is stable but at the same time flexible enough; a taxonomy of measurable UX constructs and attributes are constant such as modular system, but the Heuristics and best practices are compliant. Meaning that, despite the level of technology advances and selling products or services features changes, the foregoing approach can guide the launch of evaluation anything related user interactions by retaining the measurable UX attributes with newly elaborated Heuristics.

[Future discussion]

Now the world of service economy met the ubiquitous internet environment. Measuring digital ability is a crucial agenda for satisfying customers. In this context, UX is an essential facet to measure and improve. Accordingly, there is excellent knowledge based on the academic domain and plenty of recommendations with case studies talking about e-commerce improvement in the marketing realm. Further, as technology evolves, there are rising numbers of evaluation tools and software to use.

However, launching an evaluation from scoping to budgeting will bring numerous considerations at all times. In this situation, the UX Heuristics can realise quick and dirty actions; does not lose a comprehensive perspective when it comes to assessing with various divisions. It means the method can connects people to collaborate better by providing convergence points of each job function. Ultimately the heuristic method will impact on business objectives by encouraging internal and external customer experiences as well.

In conclusion, the needs for developing the evaluation framework will never end as a relationship between services and users changes continually. Therefore, the subject and the aim of the study are worthwhile explorations without a doubt; contribute to generating more practical and applicable UX evaluation methods in the change of future service economy.

4. Appendix

Reference for UX Constructs (1)

e-SQ (E-Service Quality), Zeithaml, Parasuraman, and Malhotra's (2000)	
1. Reliability	Correct technical functioning of the site and the accuracy of service promises (having items in stock, delivering what is ordered, delivering when promised), billing, and product information.
2. Responsiveness	Quick response and the ability to get help if there is a problem or question.
3. Access	Ability to get on the site quickly and to reach the company when needed.
4. Flexibility	Choice of ways to pay, ship, buy, search for, and return items.
5. Ease of navigation	Site contains functions that help customers find what they need without difficulty, has good search functionality, and allows the customer to maneuver easily and quickly back and forth through the pages.
6. Efficiency	Site is simple to use, structured properly, and requires a minimum of information to be input by the customer.
7. Assurance/trust	Confidence the customer feels in dealing with the site and is due to the reputation of the site and the products or services it sells, as well as clear and truthful information presented.
8. Security/privacy	Degree to which the customer believes the site is safe from intrusion and personal information is protected.
9. Price knowledge	Extent to which the customer can determine shipping price, total price, and comparative prices during the shopping process.
10. Site aesthetics	Appearance of the site.
11. Customisation/ personalisation	How much and how easily the site can be tailored to individual customers' preferences, histories, and ways of shopping

Reference for UX Constructs (2)

E-S-QUAL (E-Core Service Quality), Parasuraman, Zeithaml (2005)	
Efficiency	EFF1 This site makes it easy to find what I need.
	EFF2 It makes it easy to get anywhere on the site.
	EFF3 It enables me to complete a transaction quickly.
	EFF4 Information at this site is well organized.
	EFF5 It loads its pages fast.
	EFF6 This site is simple to use.
	EFF7 This site enables me to get on to it quickly.
	EFF8 This site is well organized.
System Availability	SYS1 This site is always available for business.
	SYS2 This site launches and runs right away.
	SYS3 This site does not crash.
	SYS4 Pages at this site do not freeze after I enter my order information.
Fulfilment	FUL1 It delivers orders when promised.
	FUL2 This site makes items available for delivery within a suitable time frame.
	FUL3 It quickly delivers what I order.
	FUL4 It sends out the items ordered.
	FUL5 It has in stock the items the company claims to have.
	FUL6 It is truthful about its offerings.
	FUL7 It makes accurate promises about delivery of products.
Privacy	PRI1 It protects information about my Web-shopping behavior.
	PRI2 It does not share my personal information with other sites.
	PRI3 This site protects information about my credit card.
Responsiveness	RES1 It provides me with convenient options for returning items.
	RES2 This site handles product returns well.
	RES3 This site offers a meaningful guarantee.
	RES4 It tells me what to do if my transaction is not processed.
	RES5 It takes care of problems promptly.
Compensation	COM1 This site compensates me for problems it creates.
	COM2 It compensates me when what I ordered doesn't arrive on time.
	COM3 It picks up items I want to return from my home or business.
Contact	CON1 This site provides a telephone number to reach the company.
	CON2 This site has customer service representatives available online.
	CON3 It offers the ability to speak to a live person if there is a problem

Reference for UX Constructs (3)

ESM (E-commerce Success Metrics), DeLone and McLean (2003)	
Systems quality	Adaptability
	Availability
	Reliability
	Response time
	Usability
Information quality	Completeness
	Ease of understanding
	Personalisation
	Relevance
	Security
Service quality	Assurance
	Empathy
	Responsiveness
Use	Nature of use
	Navigation patterns
	Number of site visits
	Number of transactions executed
User Satisfaction	Repeat purchases
	Repeat visits
	User surveys
Net benefits	Cost savings
	Expanded markets
	Incremental additional sales
	Reduced search costs
	Time savings

Reference for UX Constructs (4)

E-TQMF (E-commerce Total Quality Management framework) , Kotian & Meshram, 2017		
Quality Metrics	Quality Attributes	Characteristics
Usability (It refers to the effectiveness, efficiency, and satisfaction with which users achieve desired goals.)	Ease of use	To make site easy to use and operate
	User-friendly	To design website interface which is easy to use and understand
	Simplicity	To provide simple structure and functions
	Navigation	To support user movement within site
	User control	To permit user to leave site at all times
	Clarity	To make the user aware of the functions it can perform
	Help function	To offer help and documentation
	Understandability	To make content easy to understand
	Accessibility	To make site accessible for all users
	Speed	To make it fast to load items
	Match real world	To follow real-world conventions
	Learnability	To ease the users' effort for learning the application (E.g. control, input, output)
	Consistency	To keep the same design features through the Site
	Recognition rather than Recall	To make information easy to remember
	Aesthetic design	To design aesthetic and attractive websites
Personalisation	To make site customizable	
Functionality (It refers to a set of attributes that define the systems capability and features)	Payment	To provide secure and easy payment methods
	Navigability	To provide easy ways to navigate through the website to access the web content
	Accuracy	To provide accurate information
	Security	To ensure task performance in a secure manner
	Information Quality	(It refers to relevance, accuracy, understanding, and usefulness of information provided by the E-commerce website significantly influencing customer interaction and user satisfaction.)
	Relevance	To provide relevant information
	Completeness	To provide complete information
	Update	To provide updated information
	Authority	To ensure user confidence in information
	Objective	To provide objective and unbiased information
	Usefulness	To provide useful information
	Sufficiency	To provide sufficient information
System / Website Quality (Website quality is defined as the E-commerce system's performance in delivering information and services)	Access	To enable quick access to services
	Security	To ensure task performance in a secure manner
	Error recovery	To help error recovery
	Operation and computation	To make services simple to operate
	Appearance	To present visual design elements
	Functionality	To provide adequate functions
	Payment	To provide secure and easy payment methods

E-TQMF (E-commerce Total Quality Management framework) , Kotian & Meshram, 2017

Quality Metrics	Quality Attributes	Characteristics
System / Website Quality (Website quality is	Ordering mechanism	To process user order and track order status
	User Control	To provide control for participants over data
	Content	To provide rich content that matches user expectations
	Traceability	Effort needed to verify correctness of data processing on required points.
Service quality (It refers to the quality of the online support capabilities offered by E-commerce providers)	Responsiveness	To quickly respond to user requirements
	Assurance	To provide support for user problem solving
	Empathy	To provide caring and attention to users
	Efficiency	Capability to provide appropriate performance relative to the amount of resources used.
	Security	Deals with how safely and securely transactions and information is carried and maintained
	Serviceability	It deals with how well conflicts and complaints from customers are resolved
	Credibility	To deal with level of user confidence with the content of the website
	Communication	Dialogue that occurs between the site and its users through e- mail notification, customer service request or customer messaging
	Reliability	To deliver reliable and trustworthy services. Includes Fault tolerance, Recoverability and Degradability
	Availability	To be available to the user at the time it is needed
Portability (It refers to a set of attributes that bear on the ability of the software to be transformed from one environment to another.)	Adaptability	To adapt to different specified environments
	Installability	Effort needed to install the software in a specified environment
	Replaceability	Effort of using it in the place of other software in the environment of that software
	Co-existence	Capability of the software to co-exist with other independent software in a common environment sharing common resources.
Maintainability (It refers to a set of attributes that bear on the effort needed to make specified modifications .)	Analysability	Effort needed for diagnosis of deficiencies, causes of failures, or for identification of parts to be modified
	Scalability	The website's readiness to meet rising demands of users and usage.
	Changeability	Effort needed for modification, fault removal or for environmental change
	Testability	Effort needed for validating the modified software
	Manageability	Effort needed to re-establish its running status
	Reusability	Ability to provide for complete or partial reuse in another software product
Reputation (Deals with customer's perception of quality as affected by past experiences and perception of the website's performance, and other unexplainable intangibles)	Traffic	Represents the measurable indicator Web Traffic
	Domain	Represents the measurable indicator Domain Name
	Feedback	Represents the measurable indicator Customer Feedback
	Publicity	Represents the measurable indicator Information Publicity

Reference for UX Constructs (5)

WQD (Website Quality Dimensions on Customer satisfaction in the B2C E-commerce Context) , Lin (2007)	
System quality	System quality is manifest in a website system's overall performance and can be measured by customer perceived degrees of user friendliness in shopping at an online retailer. (DeLone and McLean, 2003)
-Website design	Website usability, reliability, access convenience, and ease of use comprised website design.
-Interactivity	User manipulation and utilization of the information provided through a website is significantly influenced by levels of interactivity (Palmer, 2002). The features of a website interface are an attractive medium for interaction between an online retailer and its customers (Hoffman & Novak, 1997). Moreover, customers should be provided with a feedback mechanism through an e-mail link or frequently-ask-questions (FAQ) section for product-related information. the extent to which a customer can participate in an interactive multi-media-based environment. Interactivity includes feedback mechanisms and multiple choice purchasing decisions.
Information quality	Information quality is likely to help customers compare products, make informed purchases, and enhance transaction security (Liu & Arnett, 2000; Park & Kim, 2003).
-Informativeness	the ability to inform customers about product alternatives. Informativeness includes information timeliness, accuracy, usefulness, and completeness.
-Security	Security: the extent to which a customer believes that paying online is secure.
Service quality	In the online shopping environment, service quality can be defined as overall customer evaluations and judgments regarding the quality of online service delivery (Santos, 2003).
-Responsiveness	A customer perceives the services provided by an online retailer are responsiveness and helpful.
-Trust	A customer perceptions of the level of trust mechanisms provided by an online retailer.
-Empathy	The care and individualized attention an online retailer gives its customers, including whether it provides targeted e-mail and personal attention.

Reference for UX Constructs (6)

FUX (Facets of User Experience), Perer Morville (2004)	
Utility	Useful. As practitioners, we can't be content to paint within the lines drawn by managers. We must have the courage and creativity to ask whether our products and systems are useful, and to apply our knowledge of craft + medium to define innovative solutions that are more useful.
Usability	Usable. Ease of use remains vital, and yet the interface-centered methods and perspectives of human-computer interaction do not address all dimensions of web design. In short, usability is necessary but not sufficient.
Aesthetics	Desirable. Our quest for efficiency must be tempered by an appreciation for the power and value of image, identity, brand, and other elements of emotional design.
Findable	We must strive to design navigable web sites and locatable objects, so users can find what they need.
Accessible	Just as our buildings have elevators and ramps, our web sites should be accessible to people with disabilities (more than 10% of the population). Today, it's good business and the ethical thing to do. Eventually, it will become the law.
Credible	Thanks to the Web Credibility Project, we're beginning to understand the design elements that influence whether users trust and believe what we tell them.
Valuable	Our sites must deliver value to our sponsors. For non-profits, the user experience must advance the mission. With for-profits, it must contribute to the bottom line and improve customer satisfaction.

Reference for UX Constructs (7)

ISO/IEC_9126		ISO/IEC 25010	
Functionality	Suitability	Functional suitability	Functional appropriateness
	Accuracy		Functional curretness
	Interoperability		-
	Security		-
	Functionality compliance		Functionality compliance
	-		Functional completeness
Reliability	Maturity	Reliability	Maturity
	Fault tolerance		Fault tolerance
	Recoverability		Recoverability
	Reliability compliance		Reliability compliance
	-		Availability
Usability	Understandability	Usability	Appropriateness recognizability
	Learnability		Learnability
	Operability		Operability
	Attractiveness		User interface aesthetics
	Usability compliance		Usability compliance
	-		User error protection
	-		Accessibility
Efficiency	Time behaviour	Performance efficiency	Time behaviour
	Resource utilization		Resource utilization
	Efficiency compliance		Efficiency compliance
	-		Capacity
Maintainability	Analyzability	Maintainability	Analyzability
	Changeability		-
	Stability		-
	Testability		Testability
	Maintainability compliance		Maintainability compliance
-	-	Security	Modularity
-	-		Modifiability
-	-		Confidentiality
-	-		Integrity
-	-		Non-repudiation
-	-		Accountability
-	-		Authenticity
Portability	Adaptability	Portability	Adaptability
	Installability		Installability
	Co-existence		-
	Replaceability		Replaceability
	Portability compliance		Portability compliance
-	-	Compatibility	Co-existence
-	-		Interoperability

UX attributes and obtained Heuristics

Constructs	Attributes	Code	Heuristics
SQ (Service quality)	Serviceability	SQ 1	Does e-commerce have customer support methods?
		SQ 2	Does e-commerce have a FAQ section that covers common customer questions?
		SQ 3	Does e-commerce have guidelines to support specific users tasks?
		SQ 4	Does e-commerce have specified contact points for each type of concern?
	Response capability	SQ 5	Does e-commerce respond to users instantly?
		SQ 6	Does e-commerce provide realtime communication tool?
	Safety assurance	SQ 7	Does e-commerce privacy policy visible within signup process?
		SQ 8	Does e-commerce have signs of customer-trust payment options?
	Reliability	SQ 9	Does e-commerce allow return or refund for the wrong purchase or damaged products?
		SQ 10	Does e-commerce able to return or refund in expected date?
	Communication ability	SQ 11	Does e-commerce have personalised service answer for providing personal information?
		SQ 12	Does e-commerce promote new products or special offers?
INQ (Information quality)	Objective	INQ 13	Does e-commerce provide product attribute information?
		INQ 14	Does e-commerce publish up to date information?
	Frequency	INQ 15	Does e-commerce publish new products or related contents regularly?
	Beneficial	INQ 16	Does e-commerce provide value-added information?
		INQ 17	Is there an additional category that features a specific information?
	Exhaustive	INQ 18	Does e-commerce provide comprehensive product information?
	Sufficient	INQ 19	Is there enough information related to products?
	Credible	INQ 20	Is the information about the products accurate, informative and convincing?
		INQ 21	Is there clear information of estimated arrival or ship date?
		INQ 22	Is the information about the refund clear enough?

Constructs	Attributes	Code	Heuristics
INQ (Information quality)	Suitability	INQ 23	Is there specific information provides for re-visit users?
		INQ 24	Is there any benefit in return for user actions?
		INQ 25	Is the content based on the users' needs?
		INQ 26	Is there review tied to specific products?
		INQ 27	Is there products recommendation related to user search?
		INQ 28	Is there products recommendation related to user selection?
	Match the real world	INQ 29	Do the copies are customer-centric?
	USB (Usability)	Ease of use	USB 30
USB 31			Does search function allow to refine the search result?
USB 32			Does category page include appropriate filters by product features?
USB 33			Does the cart page allow to update product options?
USB 34			Does e-commerce provide enough options for the order?
USB 35			Does social sign up available and convenient?
USB 36			Does guest checkout available and convenient?
USB 37			Do popups appear at the proper moment?
Ease of purchase		USB 38	Does cart functions are comprehensive?
		USB 39	Does the product page have any indicator about the product availability?
		USB 40	Does cart accessible from all the pages?
		USB 41	Does checkout page eliminate distractions from the page?
		USB 42	Does checkout show steps of purchase?
		USB 43	Do alternative payment options accessible?
		USB 44	Do info input fields are minimised?
		USB 45	Do input field features are optimised for the quick process?
Ease of navigating		USB 46	Does navigation operation easy and intuitive?
		USB 47	Does navigation elements visible enough throughout the related sections?
		USB 48	Does sale or clearance menu on top-level navigation?
		USB 49	Do promotional areas stay visible and well connected?
		USB 50	Do breadcrumbs attainable?
Ease of understanding		USB 51	Do menu or categories use a clear user-logical hierarchy?
		USB 52	Do multimedia sources sufficient for product information?
		USB 53	Do CTAs button visible?
		USB 54	Do CTAs indicate specific actions?
		USB 55	Does the checkout page show promotional code redemption field visible?
Speed		USB 56	Does e-commerce site load quickly in overall?
		USB 57	Do multimedia sources load quickly?
Learnability		USB 58	Does user interface adopted well-established conventions of other major e-commerce?

Constructs	Attributes	Code		Heuristics
USB (Usability)	Recognisability	USB	59	Does the website have specific actions, instructions and options to minimize memory load?
	Consistency	USB	60	Does e-commerce have streamlined layout and design elements?
	Aesthetic	USB	61	Do design elements have aligned look and feel across different channels?
		USB	62	Do multimedia sources present disirable visuals?
		USB	63	Do popups have an attractive look and feel?
	User Accessibility	USB	64	Do disability or age of users are considered?
	Social presence	USB	65	Does social sharing available and convenient?
		USB	66	Does social sharing flow is fluent enough?
	Responsiveness (cross devices and channels)	USB	67	Does the interface layout responsive for various screen sizes?
		USB	68	Do input fields convenient enough for the different screen size?
		USB	69	Does each input fields present the right type of keyboard?
		USB	70	Does personal information accessible across multiple devices?
		USB	71	Do product descriptions readable on the various screens?

Customer journey elements

N/N group	N/N group	Stein & Ramaseshan, 2016	
Devices	Channels	Customer-experience touchpoint elements	
Laptop	Website	1	Amenities
Mobile phone	Webapp	2	Ambieince
Tablet	Native app	3	Atmospheric elements
Smartwatch	Email	4	
Kiosk	SMS	5	
	Telephone	6	
	Live Webchat	7	Technological elements
	Social Media	8	
	Smartwatch app	9	
	Kiosk media wall	10	Communicative elements
	Traditional mail & packaging	11	
	Physical location	12	
	CS support line	13	
	TV advertisement	14	Process elements
	Printed catalogue	15	
		16	Employee-customer interaction elements
		17	
		18	
		19	Customer-customer interaction elements
		20	
		21	
		22	
		23	Product interaction elements
		24	
		25	
		26	

Anwar et al, 2018		Dzulfikar et al., 2018		Simms , 2019		Evans, 2018		
E-commerce features_Basic		E-commerce features_Personalisation		Customer Emotions				
				Positive	Negative	Emotional trigger		
1	How to shop online	1		Navigation tool				
2	Product searching	2	Architectural personalisation features	Color	Validated	Anxious	Trustful	
3	Product info which offer	3		Layout	Attracted	Anger	Instant gratification	
4	Product info best seller	4		Language	Unique	Bored	Fearful	
5	New product info	5		Product/Service/Item recommendation	Superior	Doubtful	Guilty	
6	Info about promo	6	Instrumental personalisation features	Gift/ Wish list	Expert	Regret	Belonging Affinity	
7	Product category by brand	7		Newsletter	Confident	Powerlessness	Time	
8	Testimony from customer who have purchased the product	8		Personal assistant	Comfortable	Fear	Leadership	
9	Customer Service Online	9		Recently browed items	Entertained	Stress	Value	
10	Info about the company	10		Product/ Service/Item search	Fulfilled	Frustrated	Competitive	
11	Product details offered	11		Local search	Surprise	Confused		
12	Product review	12		Local advertisement/ Promotion	Trust	Hesitate		
13	Customer/member registration	13		Relational	Social-based recommendation	Curious	Annoyed	
14	Product searching is based on the customer interests or needs	14			Summary of product review/ rating	Motivated	Disappointed	
15	New product info and promo sent to customer email	15			Rewards	Convenient	Inconvenient	
16	Link to corporate social media account	16	Commercial	Online advertisement	Safe	Uncertainty		
17	Share company products via email, social media	17		Pricing	Inspired			
18	Feature Contact Us	18		Bundle-based pricing				
19	Existance of membership and affiliation system	19		Best offer				
20	Shopping cart	20		Promotional deal				
21	Transaction History	21		Discount				
22	Customer/member data management							
23	Customer/member purchase statistics							

Customer journey

B2C EHM and best practices

Constructs	Attributes	Code	Heuristics	Best practices
SQ (Service quality)	Serviceability	SQ 1	Does e-commerce have customer support methods?	- Customer service phone number, tap to call, live chat, etc. available on Homepage and Product Pages - Provide an obvious and simple customer support method
		SQ 2	Does e-commerce have a FAQ section that covers common customer questions?	convention
		SQ 3	Does e-commerce have guidelines to support specific users tasks?	convention
		SQ 4	Does e-commerce have specified contact points for each type of concern?	- Provide contacts to meet the best for each type of question. (i.e., the question about return and refund)
	Response capability	SQ 5	Does e-commerce respond to users instantly?	- Answer back to call or email quickly as soon as possible - Allow users to book the support appointment
		SQ 6	Does e-commerce provide real-time communication tool?	- Chatbot with intelligent agents that can assist the customer immediately - Answers back to inquiries via an official account of social network (Facebook, Instagram)
	Safety assurance	SQ 7	Does e-commerce privacy policy visible within the signup process?	convention
		SQ 8	Does e-commerce have signs of customer-trust payment options?	- Show small images of credit cards, PayPal and other payment options - Display security badges (McAfee, GeoTrust, etc.)
	Reliability	SQ 9	Does e-commerce allow return or refund for the wrong purchase or damaged products?	convention
		SQ 10	Does e-commerce able to return or refund in expected date?	convention
	Communication ability	SQ 11	Does e-commerce have personalised service answer for providing personal information?	- Send a confirmation email and link for order tracking
		SQ 12	Does e-commerce promote new products or special offers?	- Show global promotion area, or promotion banners stick on the top or bottom when scrolling

Constructs	Attributes	Code	Heuristics	Best practices
INQ (Information quality)	Objective	INQ 13	Does e-commerce provide product attribute information?	- Present product facts include materials, finish, and size with measurement guide
		INQ 14	Does e-commerce publish up to date information?	- Make the price they are seeing is the current sale price
	Frequency	INQ 15	Does e-commerce publish new products or related contents regularly?	convention
	Beneficial	INQ 16	Does e-commerce provide value-added information?	- Product flags with occasional labels such as new, on sale, etc. - Repeat the main value proposition such as free shipping, free returns, or next day delivery - Add urgency elements on the products (quantity, time or seasonal limitation)
		INQ 17	Is there an additional category that features specific information?	- Themed navigation options are available such as Shop by Style or Curated Collections besides standard categories
		INQ 18	Does e-commerce provide comprehensive product information?	- Show summary page before the checkout including all the list of products, prices, taxes, and shipping
	Exhaustive	INQ 19	Is there enough information related to products?	- Display the product images from several angles and include close-ups
	Credible	INQ 20	Is the information about the products accurate, informative and convincing?	convention
		INQ 21	Is there clear information about estimated arrival or ship date?	- Provide expected on the product page or check out page
		INQ 22	Is the information about the refund clear enough?	- Provide the shipping, refund or exchange policy and other shop rules - Provide the separated section to claim a refund or exchange the product
		INQ 23	Is there specific information provides for re-visit users?	- 'Recently viewed' to remind users previous search
	Suitability	INQ 24	Is there any benefit in return for user actions?	- Discount coupon for newly registered users
		INQ 25	Is the content based on the users' needs?	- Send reminder email with items that users liked
		INQ 26	Is there review tied to specific products?	- Show social proof related to products including customer ratings, reviews, and comments
		INQ 27	Is there products recommendation related to user search?	- 'People who VIEWED also...' to help users to find the right product faster
		INQ 28	Is there products recommendation related to user selection?	- 'People who BOUGHT also...' to add order values by choosing relevant products
	Match the real world	INQ 29	Do the copies are customer-centric?	- Show the real voice of the customer by considering what are they afraid of, how does your product or service make their life better, and so on

Constructs	Attributes	Code	Heuristics	Best practices
USB (Usability)	Ease of use	USB 30	Does the search function prominent across the website?	- Make Search box visible, or implement a trigger that opens search functions when clicked (Mobile)
		USB 31	Does the search function allow to refine the search result?	- Use autocomplete with error-correction - Show search suggestions with different facets such as categories or a brand name
		USB 32	Does category page include appropriate filters by product features?	- Provide multi-select facet navigation including colours, size, materials, and style within a category to show more targeted results
		USB 33	Does the cart page allow for updating product options?	- Provide features to update quantity with steppers UI, switch options, remove products, and check product detail in the cart easily
		USB 34	Does e-commerce provide enough options for the order?	- Allow choosing different options of shipment or packaging on the checkout page
		USB 35	Does social sign up available and convenient?	- Allow users to sign up and sign in by using Facebook, Gmail or other
		USB 36	Does guest checkout available and convenient?	- Allow adding on a cart and checkout directly without account creation
	USB 37	Do popups appear at the proper moment?	convention	
	Ease of purchase	USB 38	Does cart functions are comprehensive?	- 'Add to cart' action shows a cart preview module include products list and checkout button - Do not redirect into checkout page after adding to cart
		USB 39	Does the product page have any indicator about product availability?	- Show low stock or sold out on a product page
		USB 40	Does cart accessible from all the pages?	- Expose the cart on the grand navigation bar
		USB 41	Does checkout page eliminate distractions from the page?	- Hide path to menu/categories and only allow users to go to the homepage, back to cart or contact support
		USB 42	Does checkout show steps of purchase?	- Progress bar in the checkout page to show the steps that are missing to complete the purchase and the steps that have already been completed. The progress status upfront progress instead of starting at zero to give motivation for getting things done
		USB 43	Do alternative payment options accessible?	- Various payment options but consider choice overload (Paypal as a basic) - Make a distinction between each payment method clear. Show the most common checkout method prominent on the page, or listed first among the other options.
		USB 44	Do info input fields are minimised?	- Reduce the number of fields (Remove optional fields, use the full name instead of first/last, check billing address by default)
USB 45		Do input field features are optimised for the quick process?	- Provide browser autofill and saved data should work on form fields such as name, address, email address, phone number, password, and credit card. - Automatically determining the customer's credit card type rather than drop-down selection - Inline validation	

Constructs	Attributes	Code	Heuristics	Best practices
USB (Usability)	Ease of navigation	USB 46	Does navigation operation easy and intuitive?	<ul style="list-style-type: none"> - Provide easy and quick operation to switch the pages (easy to move back or out of menu) - Consider back button action of different systems (iOS, Android) - Highlight the link to the page the user is currently on, wherever possible
		USB 47	Does navigation elements visible enough throughout the related sections?	<ul style="list-style-type: none"> - Global element (sticky menu/header) from the top navigation area is permanently visible as users scroll - Implement a floating menu that sticks as user scroll
		USB 48	Does sale or clearance menu on top-level navigation?	<ul style="list-style-type: none"> - Show sale menu on GNB
		USB 49	Do promotional areas stay visible and well connected?	<ul style="list-style-type: none"> - Present value props such as sale, seasonal promotion, or banners at global elements such as header and footer
		USB 50	Do breadcrumbs attainable?	<ul style="list-style-type: none"> - convention
	Ease of understanding	USB 51	Do menu or categories use a clear user-logical hierarchy?	<ul style="list-style-type: none"> - Order main product categories by traffic volume, organise subcategories alphabetically
		USB 52	Do multimedia sources sufficient for product information?	<ul style="list-style-type: none"> - Enable video of products to show true fit on the model - Show a 360-degree view, where they can move the product around to provide an experience close to physically going into the store - Keep menu options on one page, use a dynamic menu or expanders with better visual hierarchy, Include post-sales actions like customer service in the menu
		USB 53	Do the CTAs button visible?	<ul style="list-style-type: none"> - Show prominent add to cart button on the cart preview modal
		USB 54	Do the CTAs indicate specific actions?	<ul style="list-style-type: none"> - Use descriptive CTAs like 'Choose Shipping Rate' rather than 'Continue' or 'Next', which gives users expectations around next steps
		USB 55	Does the checkout page show promotional code redemption field visible?	<ul style="list-style-type: none"> - Make promotional code redemption field visible to prevent users from leaving checkout page to look for a code
	Speed	USB 56	Does e-commerce site load quickly in overall?	<ul style="list-style-type: none"> - Test & Optimise the sites speed to requirements from Google (above 85) for both Desktop and Mobile (PageSpeed Insights)
		USB 57	Do multimedia sources load quickly?	<ul style="list-style-type: none"> - Ease up on homepage hero slides - Decrease thumbnail image size
	Learnability	USB 58	Does user interface adopted well-established conventions of other major e-commerce?	<ul style="list-style-type: none"> - Reserve commonly used locations for various graphical elements such as having the logo on the top left, search field, sign in, and cart on the top right, exit icon on the top right, etc.
	Recognisability	USB 59	Does the website have specific actions, instructions and options to minimise memory load?	<ul style="list-style-type: none"> - Provide Like or Wishlist visible as secondary CTAs to remember search result, Consider Various Well-established Conventions When Deciding on Layout.

Constructs	Attributes	Code	Heuristics	Best practices		
USB (Usability)	Consistency	USB 60	Does e-commerce has streamlined layout and design elements?	<ul style="list-style-type: none"> - Apply graphic elements that are typically consistent and have representations that are widely understood by users - The content, the UI elements, fonts, backgrounds and colours should be in harmony and feel consistent at every touch point 		
			Aesthetic	USB 61	Do design elements have aligned the look and feel across different channels?	<ul style="list-style-type: none"> - Ensure the brand experience is consistent across all channels – whether online, in-store or on a mobile device - Use images that are consistent across multiple pages, and are also in line with the look and feel of the rest of the website - Match website and browser elements across various device
	USB 62	Do multimedia sources present desirable visuals?			<ul style="list-style-type: none"> - Show high-quality images with a white background to catch shoppers' interest and show them exactly what they are buying 	
		USB 63			Do popups have an attractive look and feel?	<ul style="list-style-type: none"> - Show eye-catching exit popup for leaving users
	User Accessibility				USB 64	Do disability or age of users are considered?
		Social presence				USB 65
	USB 66		Does social sharing flow is fluent enough?	<ul style="list-style-type: none"> - During the sharing actions, allow users can leave and come back easily to the original page 		
		Responsiveness (cross devices and channels)	USB 67	Does the interface layout responsive to various screen sizes?	<ul style="list-style-type: none"> - Ensure the right scale of design elements depend on screen size, especially when users have to open a keyboard, a selector, or a dropdown - Show a consolidated menu with hamburger and cart - Avoid large dropdown fields (less than 4 options), instead use steppers, sliders or open field input for the small screen 	
	USB 68			Do input fields convenient enough for the different screen size?	<ul style="list-style-type: none"> - Make sure the input results are visible to users 	
				USB 69	Does each input fields present the right type of keyboard?	<ul style="list-style-type: none"> - Use a numeric keypad for numeric data such as credit card numbers or phone numbers. For email-address fields, use a keyboard optimised for entering email addresses, which prominently features email-specific characters like "@"and ".".
	USB 70				Does personal information accessible across multiple devices?	<ul style="list-style-type: none"> - Show the same number of items in cart at all devices, including when the cart is empty
				USB 71	Do product descriptions readable on the various screens?	<ul style="list-style-type: none"> - Make sure that product descriptions are easy to skim (for instance using bullet points)

UX evaluation form

Consumer Journey	Initiate	Connect	Transact	Service	Engage
Steps					
Stage type					
Details					
Main actions (Interactions)					
Channel					
Channel transition					
Touchpoints - Push (Company side)					
Touchpoints - Pull (Customer side)					
Emotions Positive					
Emotions Negative					
Constructs_Fundamental					
Attributes_Fundamental					
Constructs_Progressive					
Attributes_Progressive					
Constructs_Resultant					
Attributes_Resultant					
Heuristics					
Severity Ratings					

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July 2019 Graduation Thesis

Develop an inclusive UX evaluation framework
B2C E-commerce Heuristic Metrics(EHM)

Eva Youngsin Han
evayoungsin@gmail.com

Supervisor:
Raffaele Boiano
Francesco Vetica