'What is Fair Shipping, Anyway?'

Using Design Fiction to Raise Ethical Awareness in an Industrial Context

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ABSTRACT

The HCI community cares for the human and social aspects of technologies. Ethical discussion on the social implications of new technologies often happen among researchers, but it is important to raise this discussion also in the industry that designs and implements new systems. In this paper, we introduce a case in which design fiction was used as an ethical discussion tool among company partners. We report the process of creating and prototyping a fictional world embedded with conflicting values that aimed to shift the focus from industrial merits towards societal values and raise discussion among participants. Moreover, we examine the challenges and propose suggestions in crafting critiques and friction to the industrial context. Our findings suggest why and how one should use design fiction as a means to raise ethical awareness in a technology- and profit-focused context, to support further activities on developing more humane technological futures.

CCS CONCEPTS

• Social and professional topics~Codes of ethics

KEYWORDS: Design fiction, Value fiction, Design methodology, Design methods, B2B industries, Ethics of automation

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1 INTRODUCTION

We live in a world that is constantly introducing various kinds of advanced technologies. In our private life, we may have the opportunity to choose most of the technologies we want to live with, but this is not often the case at work. Within this domain, the companies that develop technologies for workplaces are driven by their clients' rational requests for improved performance, reduced costs, and reduced risks. Automation is often seen as the solution to gain all these since after the initial investment, automated systems are expected to work 24/7 with stable quality and low cost.

In this research, we want to take a different perspective: we have chosen to view technologies designed for workplace automation as a socio-technical assemblage from the socio-technical tradition [39]. In workplaces, the design and use of information systems are shaped by the socio-cultural conditions of workers and organisational structures [34]. From our human-centric perspective, we study the relations between humans and their social and technological environments and take a good look at how these technologies will shape society and individual lives.

Unfortunately, discussions on the social and ethical aspects of technologies often remain in the academia, like critical futures studies, socio-technical research, science and technology studies, and design anthropology. Naturally, the discussion on ethical and social implications should also take place among the companies who are actually designing, developing, and implementing the new technologies. It would be risky if companies and developers, who have resources and power to bring technologies to the world, yet would not pay much attention to or care about the implications on society and people. However, there seem to be few ethical discussions in real-life industrial development projects. Therefore, these discussions are becoming increasingly necessary and urgent, especially in the accelerating Industry 4.0 transformation. Although it might not be the responsibility of business and technology

developers to provide answers, it is crucial to increase their awareness of other perspectives beyond their clients' or their own.

In this paper, we present an explorative research case in a large academy-industry collaborative project, 'Design for Value' (D4V) by DIMECC, in the business-to-business (B2B) context of marine industries. The primary goal of D4V project is business growth by developing autonomous systems and business models related to shipping. In the project, our position has been to raise awareness of and discussions about the social and ethical aspects of technological development among company partners. To achieve this, our approach was to create scenarios of possible automation-dense futures and then to engage company partners and researchers with the fictional world in a workshop setting. Our position and practices of future speculation in design fiction were implied by Critical futures studies that argue the significance of the critical and plural approaches in speculating on and creating futures. We chose the approach of design fiction as it is a powerful tool for the investigation of how technology is used and the ethical and social implications [3]. In addition, it has been suggested that sensitive issues are more easily discussed and addressed in the context of a fictional world [2].

Design fiction as a method is flexible and ambiguous drawing upon various schools of thoughts [11, 31]. In this paper, we position our design fiction practice in the paradigm of 'design fiction as world building' proposed by Lindley and Coulton [12]. The nuance differentiation of 'it tells worlds not stories' helps us clarify that storytelling was not the core in our fiction creation. Instead, the core was building a world that is comprised of divergent and conflicting dots. These dots of technologies, actors, perspectives, and values plausibly and controversially related to each other and together constructed a fictional world of autonomous future.

In building such a fictional world, we argue that the key element being prototyped was 'relations' that connected disparate values and perspectives. To be more specific, the 'relations' refer to those between marine companies and industries and other social actors. Later in the paper, we will examine how we prototyped the relations, either by exaggerating conflicting relations between extreme efficiency and workers, or by mediating a collaborative relation through the workshop tasks. Moreover, this mode provided us a way of framing our work process, with which we would like to expand the scope of our design fiction practice that previously considered mainly the written fictions [19, 28]. Here, we include the part of the workshop using fictions also as 'world building'. It was the process of prototyping a fictional world in the workshop setting in which participants also played an active role in shaping it. Therefore, the workshop became the 'container' that materialised and performed the fictional world, like the fictional research paper [27], the product catalogue [7], or a package of multiple media [31].

The research question we tackle in this paper is why and how to use design fiction as a tool to discuss ethical and societal concerns in a technology- and profit-focused industrial context. Learning from our experiences, we provide a set of strategies for prototyping the fictional world and engaging participants with it. Moreover, we examine the struggles we faced and tactic strategies we used in the process of crafting critiques and conflicts in the industrial context. The main findings from this paper, thus, are the suggestions on avoiding friction in the profit-focused context when introducing friction to provoke reflection and debate. With this work, we wish to inspire further enquiries fostering awareness and discussion on the ethical and social aspects of technological development. Also, this work provides implications for using design fiction in the B2B industry that is the new application field for design fiction. It is worth clarifying that this paper is not about the contribution to the method of design workshops or using design fiction in workshops per se, but about the investigation of how to raise ethical discussion in the industrial context with design fiction as a tool.

2 RELATED WORK

2.1 Critical and Plural Approaches in Future Speculation

What would a future of autonomous shipping look like? We are familiar with the kind of clean and shiny future scenario where the whole range of complex devices and interfaces work together seamlessly and a few happy users interact with screens with simple elegant hand gestures. Such future scenarios, often called corporate foresight [30], locate the better future in business growth as well as the excellence and advancement of technologies. They are used as a tool for strategic innovation management and new market exploration among technological industries [8, 42].

However, the approach of future practices setting business growth as the main goal has received the critique from Critical futures studies, a thread in futures studies in the era of neoliberal globalisation. Critical futures studies, influenced by social critical theories, focus on the critique of business-centred future practices and suggest more value-oriented and democratic futures [the earliest: 33, 40].

Firstly, they criticise that the better society envisioned in corporate foresight is for solely a single economic vision or fanciful consumption with little relation to the deep structural transformation of the society [1]. As a result, the scenario presents an over-simplified picture of magic technologies and blinds the audience from the complexity and diversity of both technological and social worlds. Secondly, it only serves the interest of the dominant social group or one class of people who are often the client and, at the same time, excludes the values and interests of other social groups who are often disempowered [1, 37]. For critical futures studies scholars, future practices should not be narrowed to the prediction of the best economic or technological future [e.g., 36]. Instead, the more significant value of future activities is questioning the hegemonic mode and widening human options, summarised by Candy [9] as critical and plural approaches.

Fundamentally, Critical futures studies use the theoretic concept of 'power' in the analysis of future activities implied by Foucauldian insights [e.g., 20]. Envisioning a desirable future is not about an innocent and neutral wish of making the world a better place. Instead, it is a political act of power negotiation among various social actors at the present. In practice, this means one shall not only ask 'What future is desired?', but also follow up with questions like 'Whose desirable future it is?', 'Whose desirable future should be prioritised?', 'Who can and shall have the power to decide?'. Choices are always made from a certain position, for a particular reason, and inevitably express certain values. Among a wide range of socio-technological, material, and economical possibilities, a desirable future is crafted to promote and prefer some interests and values while marginalising others [1, 32]. This is the political dimension that power is exercised to choose some desirable versions over some other. There cannot be an innocent position as Haraway [18] reminded us. Realising the political dimension of future practices, it is important to have a critical approach when speculating or examining future scenarios. As Bødker argued, it is the obligation for researchers to keep questioning the technological solutions and scenarios, which are produced by dominant social groups, on a societal level [5].

Apart from the critical investigation, another central effort of speculating futures is to sketch alternative futures and widen human options proposed by Kahn [21]. He argued that there can exist a wide range of possibilities of using technologies in living and human development. Instead of reinforcing the hegemonic mode that treats technologies as deterministic solutions, he advocated exploring different images and scenarios of potential futures, displaying various voices, aspirations, and dreams. Imagining the unimaginable is not only about the novelty of technological solutions, also about how futures can be otherwise with reconceptualised systems, structures, and categories. And speculation is an efficient space to loosen up dominant taken-for-granted assumptions and narratives, and further evoke new ideas and perspectives otherwise unseen.

These theoretic understandings of future practices provided us with a different way to look at the development work in D4V project. With the lens of 'power', we understood that speculating on a better future of autonomous shipping was not about a neutral wish for a faster, cleaner, and cheaper delivery system. Rather, in the centre it lied the analysis of power structure among involved parties of big marine corporations, SMEs, workers, consumers, and governments. Furthermore, the critical and plural approaches provided us with theoretic grounds to our ethical stance in D4V project and our decisions on what kinds of future scenario to create.

2.2 Social Value Around New Technologies in Design Fiction

In design, Design fiction takes the same ideological perspective with Critical futures studies in speculating on technological futures. One of the widely recognised definitions of design fiction is from Bruce Sterling, 'the deliberate use of diegetic prototypes to suspend disbelief about change' [6]. He emphasised later that 'suspending disbelief about change' means design fiction has an ethics [38]. Julian Bleecker, who produced the most influential essay on design fiction in 2009, explicitly argued that we should reject the progress model of 'up and to the right' or 'an advancement of technical prowess' in future imagination [3]. In design fiction, designing and prototyping a new concept or system is not to show how things should be, but to create a discursive space to probe potential implications and relevant values inherent in technologies [4, 26]. It is in line with what Dunne and Raby argued in Speculative and Critical design to 'open up a space for discussion' [14, p51]. In application, design fiction has been used as a powerful tool to question and problematise the status of technology [25], challenge the status quo [14], and increase political engagement [16].

Our practice of design fiction strongly adopted the discursive element in design fiction discourse while weakening the element of making artefacts. In this sense, our future scenarios were closer to the term 'value fiction',

as social value played a central role in creating future scenarios of autonomous shipping. However, the concept of 'value fiction' has never been explicitly studied as a separate subject and often blends into the more well-recognised forms of speculative or critical design [28]. Here, the very little discussion on social value in future speculation has provided us with important practical implications. This is one paragraph on 'social value' in Dunne and Raby's early work [13, p63]:

> 'If in science fiction, the technology is often futuristic while social values are conservative, the opposite is true in value fictions. (…) The aim is to encourage the viewers to ask themselves why the values embodied in the proposal seem 'fictional' or 'unreal', and to question the social and cultural mechanisms that define what is real or fictional.'

This description provided a rationale for creating fictions and choosing those that painted the fictiveness of social value. Although this point of clarification sounds obvious for design fiction practitioners, it helped us clarify the priority that went more to societal value than to the novelty of technologies in our creation practice. And we can see in many other design fiction projects, social value embedded in speculative technologies has been an important part of the enquiry, like issues of privacy and surveillance around the technology of drones [24], core values embedded in domestic robots [10], and urban technologies [17].

2.3 Creating a Discursive Space Through a Fictional World

Design fiction has been used to provoke discussion and reflection among targeted audience [3, 26, 29]. This part reviews a few projects that used design fiction as a discussion tool to engage people which often happened in the design workshop setting [23]. The need for input from users and stakeholders was, on the one hand, to generate insights to inform design; and on the other hand, to give an opportunity for participants to express needs, concerns, and aspirations concerning the researched technology. The liberation from the present usage context could in some cases provoke radical or alternative visions. For instance, in a case of designing new banking systems for the elderly, by using provocative and 'questionable' design concepts, Vines et al. intentionally sought criticism from the elderly users on banking systems in order to better understand user insights and design space [41].

In these projects, participants were engaged in different ways. To a large extent, they played a creative and active role in composing the whole fiction with given tasks, like 'what if' scenarios. For instance, 'what if self-driving shuttles replaced privately owned vehicles?' was a question used to explore urban technologies in Baumann et al's work [2] and 'imagine a family named Gruber living in 2039' in Prost et al's work on sustainable future energy use [35]. To the little extent, participants gave commentaries to the design concepts developed by designers [41]. Here, we particularly introduce one case that used fresh and performative techniques, 'speculative enactments' in Elsden et al's work [15]. In the case of 'exploring the romance of personal data', instead of constructing design fictions by researchers themselves, Elsden et al. used a method similar with 'improvisational acting' through which speculations were crafted by participants. They organised a real-life event of speed dating and invited participants to date by showing their personal 'data profile' filled a week prior. In the speed dates with each other, participants developed real and immediate social interactions that were grounded on the wider speculation on the use of personal data. From the project, authors argued the value of speculating on futures on an experiential and performative level.

In contrast to the abovementioned work, the engaged participants in D4V project were not users, designers, or engineers of upcoming autonomous systems. Six of them were company representatives and managers who were interested in business opportunities and new collaboration models benefiting from data sharing. The expected outcome of our workshop was not direct insights to inform the system design of autonomous shipping. Instead, participants were expected to develop awareness and discussion on the social and ethical aspects of autonomous systems.

2.4 Using Design Fiction as Critiques with Companies

When bringing the critique to a company especially whose practices are the target, the balance is important. If the critique is too strong, people might feel offended or uncomfortable, which would cause problems and frustration in interactions and collaboration. But if the critique is too implicit, it becomes irrelevant or causes no reaction. As design fiction is a relatively new practice, we could only find two highly relevant projects in this topic: 'Future IKEA Catalogue' by Brown et al. [7] and 'Building your neighbourhood' by Kjærsgaard and Boer [22]. Both explored ways of crafting and bringing design fiction as a design critique to their collaborative companies. And their reflection and the strategy of 'ambiguity' support the finding from our work.

Working in a large academy-industry collaborative project, authors together with IKEA and Ericson speculated on a future of smart homes. The outcome was '*Future IKEA Catalogue*', a piece of design fiction that highlighted the tension regarding the use of technologies in domestic space. Provocative scenarios, like a memory recording sofa and a smart cabinet, were written to prompt reflection on what if IKEA becomes a data collecting entity at home. From this project, authors asked 'how critical you want to be' in such collaboration and proposed the strategy of avoiding unpleasant situations, which was 'working with equivocality' that allowed them to 'explore subversions rather than acting as leaden criticism' [7, p336]. In this manner, companies could interpret the future scenarios in their own ways.

In the second project, a student team worked closely with a private company in city planning. Along the design process, students noticed that the company only considered business models without having the needs of people in mind. To articulate the critique of futures being solely shaped by capitalist interests and with the absence of people, they developed an interactive table, 'People before buildings', to be temporarily used in public places of the city. At the table, people could design an area based on their own needs and dreams by placing material props like trees, libraries, or shops. And the table recorded all these activities and projected the data to the company meeting room. However, as a result, the critique was too implicitly embedded so that the company contrarily saw the concept meet their needs of 'public image' and 'user input'. Authors reflected that the concept might be too ambiguous or culturally familiar to be a design critique. As learning, they called for a deeper analysis of the context referring to the social and cultural shaping of the critique [22].

3 THE CASE: PROTOTYPING A FICTIONAL WORLD OF AUTOMATION IN A B2B CONTEXT

This section presents our process of creating and prototyping a fictional world to raise ethical awareness and discussion among industrial partners on the future of automation. It describes the ways in which we, design researchers new to the domain of marine industries, looked for ingredients from stakeholder interviews to write future scenarios, identified themes to address in fictions, prototyped a fictional world in the workshop, and engaged participants with it.

This research was a small portion of work in a two-year large research programme with 11 company partners and nine research institutes. Like many other industries, the marine industry is undergoing digital transformation, which means that ships and harbours are moving towards higher levels of automation. The research themes of the programme covered business models, technological solutions, and human aspects. As typical in industry transformation, the resistance from labour unions against accepting a new system is expected. We design researchers entered this programme under the theme of 'social acceptance' (Figure 1), the activity reported in this paper, since the industry was aware of possible challenges with social acceptance and union resistance. Instead of providing solutions to overcome resistance, we decided to invite companies to develop critical reflection on the future technologies that they were keen to develop. Since this was still an early phase of transformation towards autonomous systems, where mainly company managers in R&D departments participated, it provided an excellent chance to raise up ethical discussion among company participants on what the change might bring to people and society.

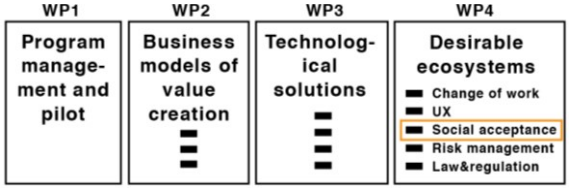

Figure 1: Our work was under the theme of 'social acceptance' in Work Package 4 in D4V project.

Our process included four parts (Figure 2). Firstly, we did 18 stakeholder interviews to seek seeds for composing design fictions. The 'seeds' were mainly controversial opinions and issues relating to futures of automation. Secondly, we created about 20 pieces of design fictions. These were short snippets depicting a future world of automation with conflicting values between marine companies and other social actors of workers, citizens, and governments. Thirdly, we developed fictional projects with tasks from the fiction snippets for the use in the later workshop. Fourth, we organised a workshop '2030, an ecosystem odyssey', in which we prototyped a fictional world of 2030 and engaged participants to work on fictional projects. In total, there were four design researchers involved in this process: two took part in all parts; the third in fiction writing; the fourth in planning and running the workshop.

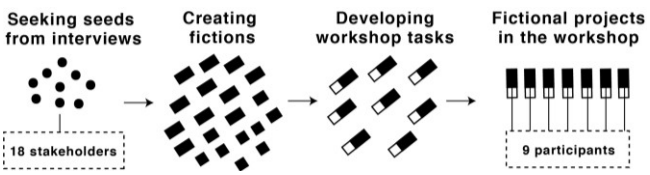

Figure 2: the four stages of our process (April-Nov, 2017)

The empirical data of the case was collected from researchers and participants respectively. The first part of the data included all the shared files of planning, teamwork notes, personal memos, materials generated from the process, and moreover, interviews with the two researchers who worked in the whole process. The second part was from workshop participants, including the audio and video materials with which the workshop was documented, seven filled-out semi-structured feedback questionnaires during the workshop, and five participant interviews after the workshop. The data analysis for this paper focused on the design decisions made, strategies used, and reflection and learnings relating to how to raise ethical awareness in this B2B context.

3.1 Identifying Different Perspectives from Interviews

To look for ingredients to feed our fiction creation, we conducted 18 stakeholder interviews each of which was from different backgrounds (Figure 3). In the interviews, we asked each to envision a desirable future of autonomous shipping. Each version was built on the interviewee's particular perspective, knowledge, and understanding of the marine industry. Apart from the 18 interviews, we attempted to gain more access to worker's voices and opinions relating to autonomous futures, by looking for online comments in some captain forums and relevant articles and columns.

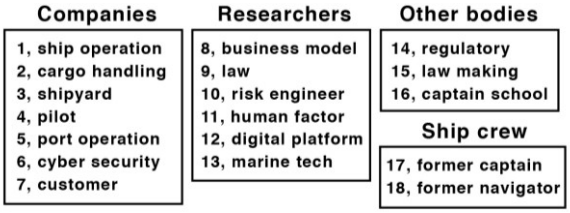

Figure 3: 18 stakeholders were interviewed

Based on different perspectives, the desirable futures emerging from the interviews took different forms and focuses: the future scenarios speculated by company interviewees featured factors like lower cost, higher efficiency of operation and energy use, more ecologically sustainable, and huge market expansion. The futures envisioned by engineers were less about one most ideal image but several technological possibilities depending on the levels of automation. Researchers in human factors were more interested in the ideal future in terms of meaningful interaction between humans and machines, while ship crew and the lecturer from a captain school mainly expressed concern with work conditions and value of human workers.

To write provocative fictions, the analysis was to not summarise a consensual version of a desirable future shared by all stakeholders. Instead, we identified controversial voices, plural perspectives, and sensitive issues. Two strong patterns emerged from the interviews. One was the unshakeable value at the core of automation: **efficiency**, in the aspects of time, space, energy, and workforce. *'Of course, higher efficiency is better. So, we can have cheaper products and happier consumers.'* one interviewee told us. It was assumed that digitalisation and automation could make parts and segments more connected with less cost and higher profits. The other pattern was the conflicting and imbalanced relations between the pursuit of high efficiency and other societal values. It was a shared view among some interviewees that, to achieve higher efficiency, more human workers would become irrelevant and redundant. Some argued that the problem was that workers often make unnecessary and stupid mistakes, and therefore they proposed replacing them with smart machines. At the same time, others explicitly questioned this technological deterministic view and argued that the technological system would be a failure if the skills and knowledge of workers were underestimated or ignored.

3.2 Embedding and Exaggerating Conflicts in Fiction Snippets

The implication from the interviews for the next step of fiction creation was the intent to question efficiency that was seen as the main goal and flawless solution, and as well as introduce other perspectives to the future world. Built on the insights above, we started to create a future world where the autonomous systems developed in D4V project exists and extreme efficiency is purchased or realised. In total, we created about 20 fiction snippets (Table 1), some of which overlapped and some more completed and elaborated than others. For a more detailed account of the creation process as well as the fictions themselves see Lyckvi et al. [28]. These scenarios unfolded a future world with various social actors who have developed opinions, attitudes and action towards the established autonomous systems. For instance, there are several social movements from labour unions and consumers, various solutions responding to unemployment, new business ideas based on big data, new ways of working and consuming, and new government policies. All told the ways in which new autonomous systems affect people, society, and business.

Table 1: the table of created design snippets: the seven coloured ones were developed and used in the workshop as fictional projects

Embedded values	**Fiction Title** Design concept. *Actor (the perspective outside of marine industries)
Open data	1 **Data open to ALL** Government policy. *Public
	2 **Untrusted partners** Business model. *Public
	3 **Stock market** Investment model. *Investors
	4 **Sharing resources** Business model. *Companies
Efficiency	5 **Arriving later, cheaper** Shipping option. *Consumers
	6 **Let algorithms decide** Shipping option. *Consumers
	7 **Bio-drone: Eagon** Delivery tech. *Animals
Workers'	8 **The badge** Tech for workers. *Workers
	9 **Exoskeleton** Delivery tech. *Workers
	10 **Rowing machines** HR policy. *Workers
	11 **Dream onboard life** HR policy. *Workers
	12 **Ship and port doctors** Jobs. *Workers
	13 **Remove human engineers** Social movement. *Workers
	14 **Remove humans from ships** Social movement. *Workers
	15 **Captain game** Game. *Workers
	16 **A retro club** HR policy. *Workers
	17 **Fair shipping** Social movement. *Workers
Sustainability	18 **Greenmarket wars** Government policy. *Environment
/	19 **The floating ports** Shipping system
	20 **Abandoned steel kingdoms** Urban renovation. *Public

Among the various perspectives, we emphasised on rendering friction, the dynamic and conflicting relations among various values. We addressed two main themes. The first theme was that human values get challenged in super-efficient technological systems. Below are the short versions of two such fictions:

> **Let algorithms decide**: A large E-retailer launches a new delivery option 'Alg-delivery' to achieve extreme efficiency and zero-waste. By choosing this option, consumers need to adhere to algorithms that decide the delivery times of their purchased products within a chosen period.

> **Exoskeleton: Upgrading humans:** In harbours, while giant containers are transported with autonomous cranes, smaller loads are shifted by human workers wearing powered exoskeletons. This way of making use of human bodies is approved as a cheap and agile solution. Also, it partially solves the problem of unemployment.

The two fictions presented the concepts in the pursuit of extreme efficiency enabled by big data from smart systems. In these technological concepts, human values, like consumption choice, privacy, and agency of body, seem challenged in an uncomfortable manner.

The second theme was about the controversial issue of removing humans. We created two social movements, '**Remove humans from ships!**' and '**Remove human engineers!**', in which the normative value is 'humans shouldn't work'. By addressing this subverted value, we aimed to spark reflection on the resolution of removing humans. In the first fiction, the few remaining ship crew protest: '*No human should be born to suffer inhuman work! We refuse to be the modern slaves of traffic oceans! We demand that ships be fully-automatised!*' In the second, the new autonomous system that has replaced all workforce is not running smoothly. Investigation finds out that human engineers are not able to understand the mundane and tactic work and, thus, fail to capture the complexity of the work. After hearing the report, the public and the industry have little tolerance with such errors: '*Human engineers, leave the auto system alone. Let AI engineers do it!*'

These snippets were closer to 'value fiction' in which the fictiveness of social values was the locus of our creation. Therefore, we prioritised rendering social values than making new technological artefacts. For instance, we chose commonly envisioned or already existing technologies like 'exoskeleton' or a social movement like 'remove humans' if they captured the conflicting relations or brought new insights to values. The new insights would be the ones that challenged the normative value systems of the audience at the present, through which we expected somewhat uncomfortable emotions and further reflection.

3.3 Prototyping a Fictional World of 2030 in the Workshop Setting

A fictional world of 2030 was prototyped in a workshop called '2030, an ecosystem odyssey'. This world was built from two parts: we, the organisers, who introduced seven fictional projects and other actors than the marine; and participants, partners and experts in D4V project, who worked on these fictional projects. The number of artefacts and prototypes of which the fictional world was made of included, on the one hand, fiction and task cards, task sheets, and props to 'travelling' to 2030; on the other hand, participants' work processes and task results produced. In this sense, the fictional world was prototyped both in material and performative forms. This part, we describe the process, decisions made and strategies chosen, of staging the workshop, especially selecting and developing seven fictional projects from the written 20 fiction snippets, as well as the discussion, reflection and experiences of the workshop participants.

3.3.1 Inviting Participants To Work For Other Social Actors Through Fictional Projects

The fictional world was prototyped during a period of two hours in the four-hour workshop. Participants spent the first hour on the tasks of actual development in D4V project, and then 'travelled' to the fictional world in 2030. After two hours, they 'travelled' back to 2017 with the insights learned from the future and produced a 'Statement' with

key principles in the development of technological systems and business models (Figure 4).

Figure 4: the four-hour workshop structure; the coloured parts were workshop tasks

This workshop was one of many planning and ideation workshops in D4V project. We promoted it as a good opportunity for developers to discuss value and brand images they would like to create through the new autonomous system. The expected outcomes of the workshop were agreed values and spirit on a strategic level on which further development would be built on. We specifically introduced the method of design fiction to help participants to dive wildly into the future world. We invited people from various backgrounds and gave priority to the ones who attended our previous stakeholder interviews. Finally, we managed to get nine participants from six companies of ship operation, shipyard, and digital technologies, and from three research institutes in the fields of user experiences, human factors, and marine engineering. The nine were divided into three teams, each including two company participants and one researcher.

We set the basic context of the fictional world that 2030 is the year when the autonomous systems developed in 2017 have been established. We invited participants to visit 2030 to have a look at what is happening after their autonomous systems have been implemented and also work on some ongoing fictional projects. We briefed them that the future world needs their marine-related expertise to help with these projects, therefore, they are invited as 'expert consultants' than representatives of companies or institutes.

The happenings in the fictional world were presented through seven fictional projects which were selected and developed from the 20 fiction snippets written at the earlier phase (Table 1). There were two episodes, each followed by tasks. In 'Ep 1: Data-ism', the three ongoing projects are the new ideas making use of big data from autonomous shipping: certificating certain goods in '**Fair shipping**' (Figure 5), a delivery option in '**Let Algorithms decide**' (in Section 3.2), and an investment model in '**Stock market**'. Each team joined one project with the common task of listing the data from autonomous shipping process that is needed for the project. In 'Ep 2: Workers', the four projects are the solutions employed by competitive companies in order to increase work productivity and well-being of human workers, including the 'badge' and 'exoskeleton'. All teams were invited to 'Employee Benefits Program' launched by Autonomous Maritime Organisation to propose solutions to help workers in the fast-changing work condition, with the given four benchmarking projects as inspirations. And they would announce their proposals to the public in the form of 'press release'. By giving such tasks, we did not expect participants to develop real solutions to help workers but to spend attention and time on workers whose values are positioned prior to business values. After finishing the tasks after each episode, we also asked participants to write 'insights to 2017'.

Figure 5: 'Fair Shipping' presented on slides, with an example of wine delivered from Australia to Finland

The fictional projects were presented in a simple and straightforward format. We introduced each project with a short paragraph on presentation slides and fiction cards, and gave participants task cards and result forms. Besides, we used several props to help participants be immersed with 2030, like wearing 'blue socks' as the dress code in 2030, wearing bracelets as time turners during the 'travelling', and magic cards in warm-up games (Figure 6).

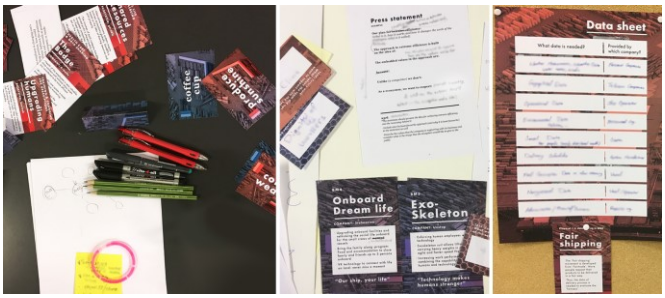

Figure 6: a number of artefacts in the fictional world: fiction cards, result sheets, magic cards, and a time turner (photos taken by Maria Huusko)

3.3.2 Project Participants Constructing the Fictional World

As 'expert consultants', participants were directly taken to the project work with the heavy workload. 'Forced' to work on the projects that prioritised interests of other parties to the ones of marine companies, they had to give intensive attention and make an attempt to realise the goals of others, especially in 'Ep2: Workers'. In all, working on the fictional projects gave company participants and researchers an opportunity to ideate new ideas and develop ethical discussion on social issues as we intended.

For instance, with the task 'what shipping can be considered as fair' in the project '**Fair shipping**', the team explored the value of 'fairness' from various aspects of the environment, workers, and end customers. Not only developing understandings of fair shipping systems, they also proposed a number of relevant solutions without being asked for, like new technological systems of self-generating energy use, slow steaming navigation, and optimised route navigation systems, and also better work culture to give more meaningful tasks to workers and customer-centred service models. Another example is that '**The badge**' provoked discussion from three teams who approached the relations between badges and workers differently. Team 1 discussed the details of wearing badges in the work context in order to avoid workers' resistance. Team 2 ideated many futuristic healthcare technologies, like proactive badges, implanted chips, remote control surgery, and automated doctors. They happily concluded that these technologies would provide '*quicker diagnosis, cheaper treatment*' to workers in the future. Team 3 started with imagining themselves as a worker wearing the badge. Soon they critically reflected that *'I don't want to be monitored'*. Therefore, they put aside the corporate goal of work productivity and cautiously proposed the policies that favoured workers' health and privacy.

Overall, from the post-workshop interviews, we learnt that participants found the part of the fictional world of 2030 valuable in several ways. First, participants found the experience of travelling to the future '*fresh*', '*exciting*' and as '*a new way of doing workshops*' as they put it. Secondly, in terms of facilitating ideation which was one of the aims for many participants to attend the workshop, the fictions, although some of which were considered *'a bit extreme'*, could *'steer creativity'*. It was evident that many ideas emerged from team discussion. Thirdly, the workshop managed to bring new perspectives to the actual project development. Several company participants expressed that they were introduced to the new perspective of 'workers' that they never previously thought of. Asked about workshop take-away, one answered '*the workshop brought new perspectives on employee wellbeing into developing the system'*. One participant called these tasks as '*provocative exercises*'. The researcher in human factors considered the main outcome of the workshop was about 'values', *'what kind of values people appreciate and how these values affect the future'* as he claimed, and appreciated that the human side was brought to the centre in this workshop. Meanwhile, one participant did not find it reasonable for companies to work on the problem of unemployment in 'Ep2: Workers', '*why only companies need to take care of workers in such circumstances'* as he explicitly complained. No matter which attitude, 'workers' as a topic has successfully provoked awareness and discussion among participants.

4 STRATEGIES AND SUGGESTIONS IN CRAFTING CRITIQUES TO THE INDUSTRY

We faced several challenges when planning to introduce critiques and conflicts to the industrial context. How should we plan the workshop to avoid causing problems in collaboration, or frustration or offence from participants? Or with a more practical concern, how could we motivate companies to attend the workshop that was not going to help them make profitable business? Negotiating with these challenges along the way, we ended up with playing safe cards to avoid friction in our collaboration. In this section, we share our struggles, experiences, and strategies in building a fictional world that introduced friction and avoided friction to workshop participants at the same time. Furthermore, we aim to provide suggestions to readers in crafting critiques and friction to the industrial context and company partners, which is the main contribution of this paper.

4.1 The Collaborative Relation: 'Working for Others' in the Workshop

In the workshop, we structured the relation between marine companies and other social actors as 'collaborative'. Pre-determined as the workshop rule, participants would need to work on the fictional projects that were either initiated by others or serving the interests of others. This rule of 'working for others' was the relation of collaboration prototyped in the fictional world. By doing so, the conflicts with others, referring to perspectives, values, and interests, were mediated by the collaborative structure. Moreover, by giving the role of D4V participants working as consultants, the perspective of marine companies was diluted.

An important element that made this collaboration feasible was the strategy of confirmation. We confirmed the success of the development of automation in D4V project and the powerful position of company participants. We confirmed the future version desired by company participants in which autonomous systems exist and more efficiency is realised. We chose this strategy for two reasons. First, when involving companies in the immersion of the fictional world, we assumed the confirmed version of the future would be easier to accept than the one with failures or breakdown. Second, it would be more provocative that the desirable future actually appears undesirable for some other social actors. In this way, the original desirability is diluted by different and controversial voices. By adding these perspectives to the desirable future, we could indicate that the desirability by one social actor might be interpreted differently by another.

Also, regarding the role, we did not subvert the existing power structure that made company participants as villains, for instance, who are the target of angry letters or strikes from labour unions, or the powerless. Instead, in the fictional world, they function as 'consultants' with their skills and knowledge appreciated and respected, which was the key element that constituted the collaborative relation.

Often in creating provocative future scenarios, conflicts and friction are rendered to provoke reflections and discussion. However, such friction only exists in the fictional world. While engaging participants with the fictional world, the relation is real that exists in reality. In order to facilitate such engagement and interaction and avoid friction in the collaboration of organisers and participants, we would recommend our strategy of setting the workshop rule of 'working for others' which is also the fictional relation between marine experts and other social parties.

4.2 Toning Down the Criticality to Open Interpretation

The second strategy was toning down the criticality in the workshop. As a result, the fictional world prototyped turned for open interpretation with the critical stance implicitly articulated. This strategy was illustrated in our process of developing fiction snippets into fictional projects and tasks. We removed some parts that had been defined by authors and left them open and unfinished. We use '**Fair shipping**' as an example. Compared with the fictional project (Figure 5), the original snippet is as below:

> Large corporations have developed fully-autonomous systems and have laid off a huge number of workers. As a resistant response, there is an initiative 'Fair shipping' from consumers that only purchase products delivered by small shipping companies and ports that still hire human workers.

This snippet presented a solution initiated by consumers responding to the problem of unemployment caused by automation. When developing follow-up tasks, we realised that 'fairness' could relate to many other aspects than merely hiring more human workers. We considered the task of discussing 'what shipping is fair' a good opportunity for workshop participants to discuss social responsibilities in technological development. As a result, the fictional project in the workshop was no longer to provoke awareness on the problem of unemployment, but to invite open interpretations of 'fairness'. Similarly, in '**The badge**' and '**Exoskeleton**', we removed the parts that described the consequences and controversial opinions from workers and company managers. The empty part was left open for participants to form their opinions, which prompted critical reflection in turn.

This strategy is similar to the one of 'ambiguity' used in the work of Brown et al [7] and of Kjærsgaard and Boer [22]. The industrial partners did not get a chance to see the original snippets that expressed a clear ethical stance and exaggerated conflicts. Therefore, our original expression of the critique or strong ethical position became diluted. However, still from team discussion, participants developed critical reflection and discussion in their own ways. The evidence is the different interpretations from three teams around the badge.

4.3 *'Getting Something Out of It'*

This strategy was specifically for the target of company participants in the profit-oriented context. When we were planning the workshop to provoke reflection and

discussion, we were constantly told that companies wanted to '*get something out of it*' when they attended a workshop. '*Something*' referred to solutions and proposals that would be beneficial, or at least potentially, to their business profits. How could we engage profit-oriented participants with a discursive space meant for ethical discussion? It is an important challenge to deal with, as it was directly related to whether we could motivate company participants to attend our workshop. Moreover, we wanted the workshop to produce an overall positive experience to facilitate future collaboration after D4V project. Our strategy was to frame the workshop tasks as being relevant to practical implications for companies' technological development and business growth. Below we present some tactic strategies developed in our work.

The tasks were designed in the way in which they could meet the two goals of discussion provocation and ideation at the same time. As the fictional project was open for interpretation as introduced in the last strategy, participants could find their own ways of either reflecting on ethical issues or ideating new ideas which they considered beneficial to their business. Also, the episode 'Data-ism' was arranged to meet the heavy demand from companies who wanted to discuss what data each company stakeholder had and how to make use of them. From the companies' side, through working on the fictional projects enabled by big data, they had an opportunity to discuss practical issues relating to data sharing in autonomous shipping. And from our side, by showing the three concepts serving the interests of other parties, we made them discuss social issues around the autonomous shipping. Another example was we particularly added the tasks of 'insights back to 2017' ('principles of data sharing' and 'social responsibilities of employers') to make the workshop tasks more relevant to the interest of companies and to the actual development in D4V project.

We would see this strategy less a compromise more a strategic choice that reflects the dynamic relation between our positional stance and the primary goal of the industrial context. As a safe card to avoid friction in collaboration, this strategy can serve well both sides to a great extent.

5 CONCLUSION

In conclusion, the design fiction approach served us well in raising ethical discussion and introducing different perspectives to the profit-focused context. Our findings contribute to using design fiction in a B2B industrial context, which is a new application field for design fiction. With this work, we wish to join the broader discussion on how design fiction practices can contribute to participatory practices of investigating meaningful technological futures. We summarise our response to the original research question, why and how to use design fiction as a tool to discuss ethical and societal concerns in this context, below.

Why design fiction? Design fiction was proved valuable in critically engaging company participants with the future world. Through design fictions, we successfully introduced the critical and plural approaches in future speculation to the B2B industrial context. By working on the fictional projects in the future world of 2030, participants examined autonomous futures free from the perspective and interest of companies, realised the existence of other values and voices, and paid close attention to workers and the social aspects of technologies.

The know-how takeaways from this project are the strategies of prototyping a fictional world in a way that they carry critiques, like in the form of overlooked issues like societal and ethical values, into companies' general conscience and thus business processes. We achieved this delicate balance in the following ways:

First, we prototyped the relation of 'collaboration' in the workshop where participants worked on the fictional projects initiated from the interests of other parties. Also, we confirmed the companies' envisioned future in the sense that our fictions stipulated autonomous supply and business chains. However, we unfolded this desirability from the perspectives of other social actors who have different opinions. Through this conflicting encounter, critical reflection on the 'desirability' was raised.

Second, to carefully avoid friction in the project collaboration, in the process of developing workshop tasks from written snippets, we stripped the critique down and made some parts of fiction unfilled for open interpretation. In this way, the critique was formed from the collaborative exploration among participants.

Third, to motivate industrial participants to take part in the events that were not meant for direct profit-making, we designed the workshop in the way to make sure the takeaway would be beneficial for the participants.

Finally, we would like to reflect on how we, as design researchers, got hired by D4V project. Project clients realised the importance of the designed systems being accepted by external social actors like the public and regulatory bodies. Therefore, they invited designers to study the possible futures that would be acceptable for all stakeholders, even those holding different values and opinions to automation. Approaching this brief of

'improving social acceptance' and 'overcoming resistance', instead of taking the problem-solving approach, we introduced a different perspective to look at the 'resistance' by using our designerly skill sets. First, from Human-centred design, we took the sensitivity and empathy with humans to question technologies from a human perspective, like social issues and underlying values on the use and implications. Second, combined with participatory design techniques, we gathered stakeholders in the workshop and addressed conflicting relations. As for the fictions themselves, we drew from the fields of design fiction, speculative fiction and took critical and plural approaches from critical futures studies.

Although the result of the workshop was promising and this paper has shown the success of this approach, we would like to propose some alternatives of world building for further explorations. In such a large programme, design fiction practitioners could have a closer collaboration with other domain experts in writing fictions or even prototyping the fictional world in a much lighter and quicker way within the workshops organised by them. Or the fictional world could be integrated with companies' daily work routines and events.

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