Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 3 Technology 2024

91617 Undertake a critique of a technological outcome's design

EXEMPLAR

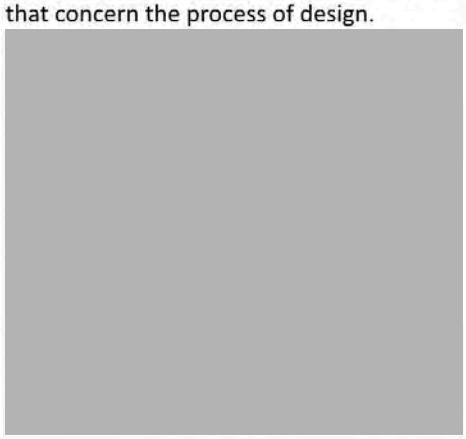
Merit

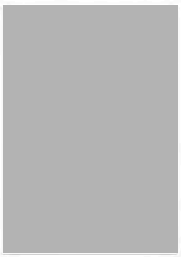
TOTAL 06

Essay by: [redacted]

Good Design:

'Good Design' is a movement that refers to products designed and judged by a set of criteria to improve the quality and usability of a product. Because of the criteria that must be represented evenly through-out the product, they commonly appear similar to products designed during the modernism and bauhaus movements. For a post-war era, it was expected to take a practical approach to designs. This meant little-to-no materials were used for aesthetic purposes. 'Good Design' originated during the late 1940s when [redacted] identified a few qualities that must be displayed by products, they were: Durability, unity, integrity, inevitability and beauty. The first 'Good Design' exhibition was hosted by The Museum of Modern Art in New York, America, in 1950. Europe received this movement favourably, especially Germany. [redacted] who climbed [redacted] influential design department, later adopted [redacted] original criteria and evolved it into 10 commandments. [redacted] one of the co-founders of Ulm School of Design was a heavily influential individual for [redacted] [redacted] took the Bauhaus design style and applied it to the curriculum of Ulm, where [redacted] studied. This is why [redacted] approach to function and aesthetics is similar to those of the modernism and bauhaus design movements. [redacted] also believed that of his 10 criteria, all should be represented equally, however, this is oftentimes unrealistic as some of his criteria conflict with one another. Additionally [redacted] criteria can reduce innovation as having numerous and conflicting criteria cause necessary compromises. [redacted] criteria are less restrictive as there are less criteria that concern the process of design.





Why does 'Good Design' change?

The concept of 'Good Design' changes over time as the aspects of what makes 'Good Design' must adapt to best suit the views of the general population. This can be because of technological advancements, the understanding or expectations the populace have learned, and limitations both legally and physically.

Technological

The technology that is available will impact the way products are designed. E.g. Technological advancements such as the 3D printer have changed the way construction is possible allowing designs to be intricate and detailed, while maintaining a low cost of production but still being fast to manufacture. These 3D printers can achieve something similar to merging of the best parts of both art nouveau and modernist movements, resulting in an easy, cost effective and practical design *with* a beautiful and expertly crafted aesthetic. The invention of 3D printers broadened the horizons of design and have allowed previously unimaginable feats to be possible. With the invention of new technology comes the downfall of older technology that would have served a similar purpose. And as the newer technology gets implemented into every-day-use, those older designs become obsolete. A design that may previously have been a good design becomes irrelevant.

Societal/Cultural The materials used in a design affect the popularity of each product. E.g. Plastic, even though it has seen use significantly more since WWII, society has learned that the disposal and production of most single use plastics are problematic for the environment. Therefore the product has a higher toll 'morally' than if it were constructed out of a material like wood which is a sustainable resource with the *potential* for a smaller carbon footprint. As [redacted] from [redacted] stated "[redacted]." We have access to this information and simply by knowing it, we subconsciously change our views to better suit our emotions. This, ultimately, is what makes change in the societal views of 'Good Design'. War itself also impacts the societal and cultural aspects of the population. After the first world war, there was a shortage of supplies which required the design process to be rethought. With designs being more practical rather than pretty - like art nouveau.

Geographical 'Good Design' isn't only applied to products either. 'Good design' is applicable when designing buildings too, so as our geographic understanding improved, new earthquake requirements have also been implemented, changing what is considered a 'Good Design'. Our understanding of geographical factors have also improved. After Christchurch's two main earthquakes (Sept. 2010 & Febr. 2011), there was a response from the government to add and improve regulations regarding the construction of buildings to minimise potential damage from future earthquakes. These new standards are now a fundamental part of the architectural engineering and designing process.

Why judgement criteria can change over time

Judgement criteria is a set of guidelines to aid in the development of a design, however, these guidelines change too. As mentioned above, the biggest contributors to these changes are because of how designers understand the components of design. These could be the materials, the functionality, even the effect it has on external factors such as the environment and the psychology of the user. As time progresses, our understanding and opinions of things change, along with this; our expectations and requirements. When these criteria change it forces designers to adapt to these new views.

For example, the judgement criteria for phones have changed significantly over time. Originally they were stationary (as they were mounted on a wall), looked like a large block, required a wire which restricted the user's mobility, and only one person could use a landline at a time. Over time, it has become expected that phones are small enough to fit in your pocket, have a flashlight, a camera, bluetooth compatibility, and applications. Generally an increase in practicality while increasing flexibility, thanks to societal and technological advancements.

The earliest available versions of monoculars were large and required both hands or a tripod to be used effectively. These telescopes were the original concept of the monocular. As time progressed technology advanced and designers were able to utilise stronger and lighter materials such as aluminium and durable plastics, and advancing the understanding of light and lenses made designs more compact and of higher quality. Now, monoculars are more durable, convenient, and portable compared to their predecessors. With these newer inventions, the technological, social, and economic criteria have changed, altering what is considered a 'good design'. Some of the more modern monoculars have the ability to adjust their magnification. This can make the monoculars more appealing to customers who would typically require a variety of ranges such as utility in golf and hunting, however, it does also come with its own set of functional deficiencies. With these newer materials comes an increase in resistance toward environmental factors too; frequently fluctuating temperatures, moisture, and debris are less of an issue and make the monoculars a great choice for outdoor activities.

How can critiquing improve a design

Critiquing a design is what gives a design its purpose and without a target audience or main goal the design will only appeal to a small section of the population. When an idea is under development, the designers will always refer to a list of criteria in order to make sure their design is on track to meet the expectations and requirements of the target audience, taking care so their decisions compliment the purpose of the design and who it's for.

The number of criteria will affect the overall outcome of the design. When something requires a large number of criteria, common among 'design by committee', designs will typically end up less innovative but highly functional. Designs that have fewer criteria, recommended for 'design by dictator', will usually result in an innovative design that may feature a few functional deficiencies.

'Design by Committee'

'Design by committee' is where a group of people consult designs based on a set of criteria. Because it is most effective with 7-12 people there can be a large variety of opinions and concepts, which can also bring conflict of interest. This process typically removes creativity as the group needs to agree on what is best for the product, rounding out all the inefficiencies and risks in a design and focusing on function rather than aesthetics.

Significantly compromised aesthetics, and innovation while being a long and expensive process - Is highly functional and boasts low risk. May also be more inclusive.

'Design by Dictator'

'Design by dictator' is where a single individual creates a design based on a personal set of criteria. This is effective when the designer is supported by like-minded individuals. This process typically suffers from functional limitations as the designer needs what's best for the creativity of the product, potentially making it less reliable or generally of worse quality and focusing primarily on aesthetics.

Slightly compromised functionality with above average risk. Typically less inclusive in nature. - Is innovative and creative while also being cheaper and quicker.

Chosen judgement criteria

I have chosen 'Fitness for Purpose' and 'Sustainability' as my judgement criteria. The 'Fitness for Purpose' will guarantee that my design is functional, user friendly and aesthetically pleasing. The 'Sustainability' will ensure that I am mindful of the costs, environmentally and economically as well as the social side of my designs. I may need to compromise on the aesthetic side of my designs as prioritising the functionality is more important for my product.

Fitness for purpose

'Fitness for Purpose' refers to a set of criteria that determines the properties of a design, including: The functionality, the aesthetics, and the benefits the user gains for using the design (these could be physical or emotional). Most importantly, 'Fitness for Purpose' means your design ***actually*** performs as it was intended and meets the users expectations and requirements.

Functionality:

Refers to the operational aspect of the design process. It uses ergonomics, efficiency, and versatility to conclude whether the practicality of the product is appropriate for its intended use.

Aesthetics:

Refers to the visual aspect of the design process. It uses materials, design elements and form to conclude whether the appeal of the product is appropriate for its intended use.

Users:

Refers to the consumer aspect of the design process. It uses customisation, expectations, and behaviour to conclude whether the product is appropriate for its intended use

Functionality is necessary when designing monoculars to guarantee the performance, durability, portability, ergonomics and compatibility with accessories remain uncompromised and meet the users' expectations. By prioritising functionality, manufacturers can create monoculars that meet the needs across numerous diverse outdoor activities and environments from hunting in a shady forest, to bird-watching from a sunny balcony. Both hunting and bird-watching require a significant amount of patience so prioritising on a comfortable and ergonomic design is more important than the aesthetics.

Sustainability
'Sustainability' refers to a design's ability to accommodate for the societal, environmental, and economical factors of design. When a design can be produced that supports all three of these categories it can be considered truly sustainable. However a design that only supports two of the categories can still be reasonable.

Societal:
Refers to the well being aspect of the design process. It uses laws, accessibility, and morality to conclude whether the availability of the product is appropriate for its intended use.

Environmental:
Refers to the ecological aspect of the design process. It uses disposal, resourcing, and distribution to conclude whether the carbon impact of the product is appropriate for its intended use.

Economical:
Refers to the financial aspect of the design process. It uses sales, operation, and maintenance to conclude whether the price of the product is appropriate for its intended use.

The environmental aspect isn't quite as necessary when designing monoculars as they aren't made to be thrown away in a short period of time. They are meant to be durable and efficient to reduce operational and maintenance costs for the user so a compromise may be made to improve the economical rather than the environmental aspects. Using recycled but durable plastics and energy efficient components will help to reduce the impact this compromise may have on the environment.

Critique

- These monoculars are meant to be held with the left hand

Monocular 1920-1990 **Functionally they are the same, the only difference being the number of 'tubes'**

The gives a good balance between age and a variation of technology available compared to more modern options. It was also rather revolutionary in terms of the binocular/monocular industry.

History of:

is a company that manufactures optics and optoelectronics founded in 1846 by . It has developed along with it's business partners numerous innovations and patents: apochromatic lenses, , and being the most notable.[1] Since the creation of the , there have been numerous advancements in the optics industry. The glass used in the porro prism formation (schmidt-pechan) inside the binoculars (the part that is shaped like 2 off-set trapezoids) has become clearer and the coatings of the prisms have made them more reflective and better at redirecting light. This makes the image clearer and brighter with strengthened contrast, an added bonus of being magnified.

The is a post-WW2 product and as such, when Germany was separated, so too was . A combination of their primary work-force getting drafted, the separation of the main facility, and the destruction of

important equipment and transferal of engineers, scientists, and labourers by the Russian held site created chaos within the firm and slowed total production, relying on foreign labourers and forced labour to make up the losses. Because of the war, the societal views had changed along with the reputation of [redacted] There may have been an increase in cost per item to compensate for the lack of expertise in manufacturing too. This would have changed the societal views and the economical sustainability of the [redacted]

This product is constructed with the main body mostly consisting of 'metal' and the hand grip has a texture of vulcanised rubber.[2] It has bakelite eyecups which were removed with the [redacted] which allowed unrestricted use from consumers requiring glasses.

Important designs by [redacted]
1886 = [redacted]
~1900 = [redacted]
1935 = [redacted]
2004 = [redacted]

The Need:

Binoculars and monoculars are not a necessary item among a typical everyday life. The target market of these products use them to aid in a hobby, whether it be bird watching/birding, hiking, or hunting. Particularly low magnification monoculars can also be used to read bus timetables, or in-depth viewing of art or gems. During the earlier production of the [redacted] binoculars, they were manufactured with the intended use of military application but later, after the wars, were released to the public. Considering the time and intended application of the [redacted] binoculars, they needed to be durable, practical, affordable but require few resources to produce.

[redacted]

Fitness for purpose

Aesthetics: Black metal with what seems to be a vulcanised rubber grip. It is slim-line and materialistically mindful. For its time, this was what would be expected. As this was designed with wars in mind, bright colours such as yellow, red, and blue would not be integrated into this design. Because of the scarcity of materials during and after the wars, the design had to be well-refined in order to 1) not be too heavy, and 2) save those materials for other products. The vulcanised rubber adds texture to the grip and allows for an easier hold of the product, and makes it slightly more interesting. Its asymmetrical shape that skews away from the centre allows

[redacted]

Function: This product is relatively compact and practical. Its shortness made it more portable and did not require too much room among the kit of required items that a soldier or a civilian would be carrying. It has a rounded grip that slumps away from the eye-piece. This creates an ergonomic grip that fits inside a loose hand perfectly with the surface touching almost the entire underside of the hand. The prisms inside the [redacted] are aligned to invert the observed image and save length. The binocular variant of [redacted] optic weighed roughly 700 grams which based on some short research seems to be the most preferred weight. The main body of the optic is covered with a texture-enhancing material making it more tactile and safer for the user by reducing the chance of slipping from the hand.

[redacted]

Ergonomics: Similarly with all products, the ergonomic aspect of binoculars and monoculars are incredibly important. The curves in the form create a larger surface area for the hand to grip, this reduces the amount of pressure on any given point across the hand by spreading it further around and making it less painful. The shape that the hand

needs to be to hold an object matters too. The diameter of a cylindrical object affects how much force can be used to support the object. The smaller the diameter,the more force per unit of area, creating a stronger and more secure grip. This is seen in the [redacted] (bi/mo)noculars through the tapering of the grip. This places the line of control closer to the C.o.M. (centre of mass) giving the user better control and balance of the optic. The mass of the object is necessary to take into consideration too. If an object is too heavy, holding it for extended periods of time could exhaust the user. The [redacted] took this into account by using less materials while focusing on the functionality of the product. This made is suitable for military use in its older days as it wasn't as cumbersome as other options. More recently for civilian use, it still holds significance as hiking, hunting, and birding became more popular.

Users/Target Market: The target market for this product in its earlier years was the German military, so a design that was appropriate for soldiers was essential. It needed to be intuitive and professionally made both aesthetically and functionally. The colours that were chosen, majoritively being black, perfectly reflects the mature nature of this product. Because the geometry of the human face is different from person to person, they needed to make a design that was intended for the majority of the population. By adding a hinge that connected the two main tubes, they allowed the user to bend the tubes to the correct geometry.

Summation

The [redacted] was fit for its purpose as an aid to one's optical abilities. It features well thought-out ergonomics with weight, size, and form. For its time it was one of the best competitors for functionality-for-price as it was one of the first designs to feature [redacted] lens coatings to improve image clarity and brightness. The chosen design had an appropriate appearance given its nature as a military tool, while preserving it from a boring general design which occurs frequently with designs of a similar purpose. I believe that the [redacted] 8x30 (bi/mo)noculars fit all three of the criteria for 'fitness for purpose'.

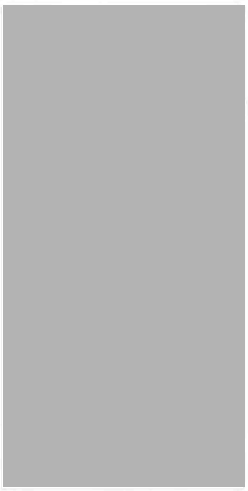
Sustainability

Societal:

The [redacted] binoculars were among the most popular binoculars of their era, due to their proportionally low cost compared to its competitors. Before and after the war, sourcing a pair of these binos was relatively easy as for the most part, Germany had a good reputation for high-quality products. Whether you were in the USSR or from England, a dream to achieve such a product was reasonable. However, the main material for the case and shoulder strap is real leather. Although this offered better durability, and people didn't care too much about it back then but now, real leather isn't ethical as there are substitute "faux" resources that can pass as "the real deal" to the average observer. Because [redacted] was sure that the best products were the ones made through expert craftsmanship, the cost in both time and labour that went

into each binocular was high. There are no cultural aspects included in the final design: a wise choice given the intended purpose of this tool. Originally the design only had a fixed metal eye-cup. This was later changed to a manipulable rubber eye-cup which improved its comfort and allowed the use from individuals requiring spectacles .

Economical:
The cost of these products were low compared to their competitors and remained possibly the best choice in terms of a quality-to-affordability ratio. The design itself was well thought out, requiring fewer materials. However, the materials they did use were long lasting and durable for their time. But, as stated above, the production process was meticulous, time consuming and needed the aid of trained professionals. After the war in particular, and the patent for for lenses, the cost of production increased making them higher in both quality and price for all parties.



Environmental:
Only packaging was the carry case made of leather which didn't seem to be very
In its time, the environmental aspect of the product wasn't regarded as such a large issue which is made rather obvious in this design. The use of real leather has a rather high impact on the sustainability of this product as leather requires the farming of cows and processing the leather. This requires large amounts of resources and releases high amounts of pollution. However, the design itself is well-refined, meaning the materials it did use were minimal. This would've helped to bring down the environmental impact as more products could be made for the same amount of resources as its competitors.

Conflicts between Judgement Criteria and varying perspectives + Compromises
Overall for its time, it was very well designed. Focused more on the function of the binoculars rather than the aesthetics while maintaining the economical sustainability. Environmental sustainability wasn't as much of an issue at the time so it makes sense that they compromised on that. There was also a compromise that had been made to improve the inclusivity of the product. By changing eye-piece to a spectacle friendly option it increased the societal sustainability of the optic. Of course, due to the 'law' of flexibility trade-offs, this did result in negatively affecting the function of the binoculars by reducing the field of view for the viewer. I can't find any sources that tell me precisely what the main body of the product is manufactured with, but it was common for a magnesium alloy weight reducing metal to be used so I'll assume that's what it is. With a trade-off to the economic sustainability, introduced their patent which impacted the image clarity and brightness significantly (in a good way). In order to ensure the quality of their products, they kept their official business in Germany with the trained professionals, which in turn made the process more expensive and time consuming. The materials weren't particularly environmentally or ethically sourced. However, this was not a problem in it time.

Design improvements and rationale for changes
I genuinely believe the final design for the was a near perfect design in the way I am interpreting its criteria. For a binocular fit for military use, it is best to take any compromise in societal sustainability if it can improve the function of the tool. The only adjustments I would make are available because of more modern technology: to improve the image clarity and brightness, krypton or argon filling inside the binocular tube to improve its resilience to extreme temperatures and prevent the build-up of moisture and fogging on the internals of the binocular, use a substitute good as a faux leather alternative that can keep the strength and laceration resistance of real leather, and change the eye-cup to a removable spectacle-unfriendly ergonomic eye-cup to reduce the amount of stray light that reaches the eye-piece for those who prefer it.

It would be economically more viable if the binoculars didn't require such a labour intensive production process. Introducing some more intuitive machines for the shaping and cleaning of the lenses would decrease training time of operators, and hasten the production of the binoculars. The real were only manufactured in Germany. To cut costs, production *could* be moved over to China. However, staffing professionals there would be

difficult to accommodate for and binoculars need the assistance of said professionals to ensure their high quality so it is best to remain in Germany.

Conclusion

The [redacted] as a whole was a huge success. The product was designed appropriately for the military, featuring a lightweight magnesium alloy frame, a surface with increased tactility for the grip, a comfortable and ergonomic hand shape, and a reasonable field-of-view vs magnification. The revolutionary [redacted] only improved its functional abilities. Its professional appearance more than compensated for its lack of interesting colour, and the texture of the grip gave a much needed contrast between the harshness of the smooth frame. Its odd but symmetrical form gave a little satisfaction to the observer. Its user-friendly hand holds made it drive a hard bargain compared to its opponents, and the introduction of a [redacted] variant suitable for spectacles resulted in a larger target market. It was the best option for a cost vs quality product. The materials used, while not particularly friendly to the environment, would go a long way resulting in more products per resource. This really was one of the most important optical devices created in all of history, and as such, I believe this was indeed a "good design".

This product features many highly important functional aspects I wish to implement in my own design. Things such as a similar lens build (only one tube as it will be a monocular), the image-improving [redacted] to the lenses to allow light to be less affected by the glass, and a lightweight but strong and durable metal such as a magnesium alloy or aluminium. I might play around with designing my own ergonomic eye-cup using a flexible and soft material like rubber. The shape is very important for the design as if the hand is uncomfortable using this product, it will become obsolete. So the skewed shape will be of great help. I will attempt to make it a multi-tool too, by adding a digital rangefinder system, and torch as well as give it a picatinny rail to allow compatibility with suitable mounts.

References

Fiell P & Fiell C. (2019) *100 ideas that changed design,* pg 156 - 157. London, Laurence King Publishing.

Fiell P & Fiell C. (2006) *Design Handbook pg 96*. Taschen, London.

https://www.eamesoffice.com/the-work/good-design/ MOMA exhibit

Defining good design. An attempt to deconstruct what 'good' means. ← That's a good one

What is "Good" Design? A quick look at Dieter Rams' Ten Principles.

"He was strongly influenced by his grandfather who was a carpenter. Prompted by his friend he applied for a job at the German electrical products company Braun in 1955. During his 40 years at Braun, Dieter Rams produced and oversaw 500 innovative products as chief of design."

[redacted] 10 Timeless Commandments For Good Design

How I chose a suitable laser

So light travels slower through glass than it does in a typical atmosphere. Therefore, when light rays hit glass that is shaped convex and flat on the other side, the focal point will converge behind the lens. If it is shaped concave, the focal point rests in front of the lens.

Zooming Binoculars

Birding

Illuminated reticles

Curvature = Magnification

Why prisms

https://www.youtube.com/watch?v=rBLI4CW9nac ?

Carl Zeiss binoculars and processes

Apochromatic lenses
T* coating and T* Multi-coating
Comparisons

History of [redacted] (Useful)

Read here for general information
More images and comparisons for the [redacted]

Lasers for rangefinder:
Laser 0
Laser 1

TBD:
https://www.rp-photonics.com/laser_rangefinders.html#:~:text=Apart%20from%20the%20laser%2C%20photodetector,and%20charging%20the%20battery%2C%20etc
Rangefinder notes:
The distance can then simply be calculated as one half the measured round-trip time divided by the velocity of light.

(**survival multitool** - IR/visible red laser, White light flashlight, (Bi/mo)nocular, rangefinder, belt/hook attachment, phone attachment for videos and/or pictures,)

Merit

Subject: Technology

Standard: 91617

Total score: 06

Q	Grade score	Marker commentary
One	M6	The report discussed the importance of contemporary judgment criteria and clearly explained why modern standards and frameworks are essential for evaluating technological outcomes. It addressed how such criteria reflect current societal values, ethical considerations, sustainability, and user needs etc. The candidate showed evidence of evaluation of standards that aligned specifically with the selected technological outcome's purpose, function, and context. They structured the report so that the majority of the content revolved around analysing and evaluating the technological outcome against the selected criteria, showing clear evidence of understanding.