BSc (Hons) CAD

RESEARCH REPORT

How can sustainable design solutions be utilised in the packaging industry for improved circular creation, production, and disposal of food packaging?

Lucy Hopkins (1905510)

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(Exc. Title, Contents, Glossary, Quotes, References & Appendices).

CONTENTS & GLOSSARY

Acronym Glossary

A-BIM	Building Information Modelling and Artificial Intelligence.
AD	Algorithmic Design.
AI	Artificial Intelligence.
BIM	Building Information Modelling.
CAD	Computer Aided Design.
CAM	Computer Aided Manufacturing.
COP26	26th Conference of the Parties (United Nations).
EDP	Eco-design Principles.
EUR	Extended User Responsibility
FEA	Finite Element Analysis.
GD	Generative Design.
GHG	Green House Gas.
GPGP	Great Pacific Garbage Patch.
LCA	Life Cycle Analysis.
NPO	Non-Profit Organisation.
PLA	Polylactic Acid.
PSS	Product Service System.
RTE	Ready-to-eat.
R&D	Research and Development.

Glossary

Biodegradable	A material capable of being broken down by living organisms.

Biomass	Organic material that can be used as fuel.
Bioplastic	A biodegradable plastic made from biological material.
Biopolymers	A chain of large molecules made from living organisms.
Cradle-to-cradle	A sustainable strategy that mimics the regenerative cycle of nature where waste is reused.
Circular & Circular Economy	An industrial system that prolongs the use of resources and waste for a long as possible.
Closed-loop	A process that involves the reuse of waste during product for further uses.
Compostable	A material that will naturally break down into natural by-products.
Deep-Tech	Technological discoveries in science and engineering that impact industry and human life.
e-commerce	The electronic buying and selling transactions over the internet.
Eutrophication	A process caused by the pollution from pesticides in a body of water that becomes overgrown and damages biodiversity.
Microplastic	Extremely small pieces of plastic debris.
Remanufacture	The building of a previously made product for further use.
Styrene	A petroleum by-product that is used to made plastics and resins.
Virgin material	A raw material.

Thesis Statement, Aims, & Objectives

INTRODUCTION & THESIS STATEMENT

This report will explore sustainability and food packaging as the narrative for the final dissertation next semester. Research within these fields will reveal diverse perspectives for critical analysis and evaluation, and the validity of the thesis question. This narrative represents a personal interest and relates industry aspirations after university. In packaging, cradle-to-cradle design is particularly fascinating, especially how biomass from food packaging waste could be repurposed. Therefore, to understand how the sector is dealing with increased demand whilst making sustainability commitments, it is necessary to investigate the present trends, problems, and future solutions in food packaging. This research could reveal the next steps towards a more environmentally friendly system for each stage of process.

This report outlines a clear set of aims and objectives to help inform the collation of relevant literature, along with an analytic discussion, and final explanation of the methods and time management utilised to conduct this report.

Thesis Statement:

The current rate of consumption in the food packaging industry is not sustainable. To prevent further degradation to the environment and conserve natural resources, stakeholders must utilize sustainable and efficient solutions such Computer Aided Design (CAD) tools to reduce waste and integrate a fully circular economy.

AIMS & OBJECTIVES

Aim:

To explore how the application of more sustainable practices across the design, manufacture, and disposal of food packaging can improve the environmental benefits and sustainability of the production life-cycle.

Objectives:

1. Explore the current industry trends and key players in the wider packaging industry to identify to what extent these are sustainable.

2. Highlight the direct impacts (social, environmental, & economic) of these current trends in the design, production, and disposal of food packaging.

3. Identify the future predictions of current industry practices in food packaging.

4. Examine any factors within future trends that would impact the sustainable design, production, and disposal of food packaging.

5. Review how strategies within digital design could pose as the potential solution to the sustainable future of the food packaging industry.

Literature Review

INTRODUCTION

This section is structured to examine the journey of the secondary research, starting from the general packaging industry onto the niche of food packaging. To the present and future implications of the food packaging industry, and exploration of CAD and related design practices.

1. The Current Market Trends in the Packaging Industry

The first area of literature explores the current rate of design, production, and disposal in the packaging industry. The informative literature within this field was easy to find, selected from 2019 upwards to maintain validity and relevance. The majority agreed that the increased demand for food, combined with accelerated population growth – 70 million by 2030 - (*FutureAgenda*, 2021, [online]) and impact of COVID-19 on 'social, economic and environmental norms' (Bullet, 2021, [online]), has changed the course of the food packaging industry.

Consumers demand 'ready-to-eat (RTE)' produce that is convenient but also eco-friendly, and in response producers have introduced initiatives, such as biodegradable packaging, to meet sustainability goals set by the government (e.g., COP26) (PR Newswire, 2021a, [online]). This positive overview is further supported by collective industry investment to design packaging that is environmentally-friendly (PR Newswire, 2021b, [online]). This illustrates the domino effect of sustainability as a trend and solution in tackling unsustainable production. Similarly, the supermarket Tesco boosted their eco-efforts by partnering with TerraCycle in 2020 to bring Loop to the UK, an initiative where food packaging is made from stronger materials (e.g., aluminium) so that vessels can be 'returned, cleaned, and reused' (Bullet, 2021, [online]).

Conversely, other sources question the efficiency of these efforts as being too challenging to decrease the ecological impact whilst making economic gain (Thomas NetNews, 2019, [online]). However, Waitrose and Partners, the leading UK supermarket in the reduction of packaging waste, is set to 'increase reusable and unpackaged ranges' (Bullet, 2021, [online]) and proves that making small changes over time will offset economic loss (Thomas NetNews, 2019, [online]).

The supermarket plastic league table

		Reduced plastic	Reusables	Reduction commitment	Reuse commitment	Recycling	Supply chain	Transparency
1.	Waitrose	60%	60%	78%	48%	29%	76%	91%
2.	Aldi	42%	40%	71%	41%	40%	59%	81%
3.	M&S	67%	30%	22%	24%	43%	46%	77%
4.	Lidl	40%	30%	46%	35%	54%	63%	98%
5.	Sainsbury's	33%	50%	72%	22%	67%	56%	91%
6.	Tesco	11%	70%	63%	63%	47%	76%	89%
7.	Asda	29%	70%	30%	59%	26%	46%	80%
8.	Co-op	22%	50%	57%	11%	43%	59%	80%
9.	Morrisons	9%	40%	46%	48%	49%	54%	91%
10.	Iceland	22%	60%	63%	19%	11%	22%	57%

Colours
Green: good
Yellow/orange: needs improvement
Red: poor

(Greenpeace, 2021, [online])

There is also evidence of changing consumer attitudes, as revealed in an EcoFocus Trends survey, where 8 out of 10 shoppers agreed that being eco-friendly is ‘ “common sense” ’ (PR Newswire, 2020, [online]).

However, this still fails to consider that single-use food packaging -900,000 tonnes annually contributed by supermarkets (Lewis, 2019, [online]) - will continue to saturate the market value chain. It is universally accepted that supermarkets aren’t doing enough and should become as ‘sustainable as the waste they are responsible for!’. The impacts of COVID-19 lockdowns on retail and packaging production, from panic-buying (Bullet, 2021, [online]) to consumer expectations for plastic container use due to hygiene concerns (PR Newswire, 2021a, [online]), have interrupted producers in meeting their sustainability pledges. This normalisation of packaged produce proves that plastic is still a leading product choice in the food and general packaging industry. Although, to what extent does this impact the environment and human health?

2. Implications of the Food Packaging Industry

This section explores the extent the food packaging industry contributes to the depletion of the worlds environment and resources. Most sources hailed plastic packaging as the main culprit, with only a few diverse discussions on packaging and the environment. Overall, this literature was educational, with some promotional business pieces still having relevance due the authors' professional industry and sustainability credentials.

The consensus was that the creation of all packaging damages the environment and human health to some extent, from greenhouse gas (GHG) emissions to litter clogging water streams (*Eco To Go Food Packs*, 2020, [online]). One standpoint by Food Print, a research Non-profit Organisation (NPO), claimed that the packaging industry has a lack of concern for social and environmental wellbeing. This is somewhat exaggerated but aligns with the widespread viewpoint that plastic food packaging – generating '40% of the global demand'– is the biggest contributor in the current climate crisis (FoodPrint, 2019, [online]). The magnitude of this is illustrated by two plastic islands between North America and Japan called 'The Great Pacific Garbage Patch (GPGP)**'**, that is 'three times the size of France' (*Eco To Go Food Packs*, 2020, [online]).

(WorldAtlas, 2021, [online])

Other sources agreed that fossil-based packaging is damaging to marine and land biodiversity (Ncube *et al*., 2020, [online]), but also worryingly harms humans. This can occur via the ingestion of microplastics, or food contaminated by potentially toxic chemicals, such as styrene, in the linings of disposable packaging items. This proves need to equally balance the safety of packaging contents with the risk to human health.

A diverging point is that packaging is vital in the food system, along with other industries like pharmaceuticals (FoodPrint, 2019, [online]). This is true for supermarkets, who rely heavily on packaged goods to maintain hygiene and preserve produce. On the other hand, the latest alternatives, such as bio-plastics (PLA), biodegradable and compostable materials, convey the effort of stakeholders to make responsible changes. These natural materials are considered the solution because they can decompose (*Eco To Go Food Packs*, 2020, [online]) and eradicate the excess waste of the traditional production process (Dufaylite, 2020, [online]).

(Eco & Beyond, 2021, [online])

However, even these have an 'ecological price tag' (*Eco To Go Food Packs*, 2020, [online]), with the resources PLA production requires (FoodPrint, 2019, [online]) and pesticides that result in the eutrophication of surrounding marine biodiversity (Mendes *et al*., 2021, [online]). The environment can also be threatened by the incorrect disposal organic packaging, that can ruin the 'purity' of regular recyclables if mixed, resulting in entire bins sent to landfill (*Eco To Go Food Packs*, 2020, [online]). This highlights that all packaging has environmental consequences (Mendes *et al*., 2021, [online]), with even traditional packaging (e.g., glass etc.) requiring substantial energy to produce or recycle. Will the shift from linear production ever occur? (Carter, 2021, [online]), when the convenience of food packaging is still prioritised above the environment.

3. *Future Synthesis* – Projections of the Food Packaging Industry

The future population increase and excessive demand for food is set to exacerbate the impacts to our climate. It was challenging to locate relevant academic sources on this future synthesis, and therefore demonstrates gap in existing literature.

COVID-19 has dramatically impacted consumer shopping behaviour, from the increase of e-commerce to consequently, the accumulation of unsustainable packaging waste. Other sources voiced more positive outcomes with food packaging, as magnified consumer attitude for sustainability, encouraged manufacturers to re-structure how products are packaged (Payne, 2021, [online]). Madl (2021, [online]), also discussed that the transportation stage is set to change, by encouraging better delivery efficiency, via 'smart warehouses' that release drones and 'driverless trucks'. This innovation aims to reduce fuel consumption and make this part of the life-cycle completely carbon neutral.

However, consumer awareness is preventing any such progress. Often seen through customers being ignorant of any improvements and dismissing them (especially supermarkets) as an act of self-interest (Supermarket Perimeter, 2021, [online]), despite the stated 67% worldwide believing in the importance of recyclable packaging (Payne, 2021, [online]). A recent initiative that relies on consumer participation is 'Loop Reuse Stations' by Tesco (*Loop*, 2021b, [online]), where customers return empty packaging that is carbon neutral after three cycles (Payne, 2021, [online]). Judging by this conclusion, the ethical future of food packaging rests on better communication between consumer and producer. The increased investment at the use stage of the packaging life-cycle, as well as design, is required (Supermarket Perimeter, 2021, [online]).

(*Loop*, 2021a, [online])

Alternatively, this doesn't consider the projected 'eco-warrior' perspective of the next generation, which sees 83% of younger people open to spending more for sustainably

packaged products. This also conveyed their view against single-use plastic and the push to completely remove this material, but unfortunately industry reliance on plastic makes this practically impossible to achieve in today's market. A plausible solution is the sole use of recycled plastic, instead of virgin material, to reduce the impact to the environment overall and demonstrate sustainability efforts (Payne, 2021, [online]).

Furthermore, today's end-of-life infrastructure is arguably unsuitable to process the current rate of disposal, as only two-fifths of the 40% of plastic packaging in the European Union is recycled! (*COST Association*, 2021, [online]). This leaves most waste as litter or in landfill, reinforcing that the justification of plastics and 'total recyclability' (Supermarket Perimeter, 2021, [online]), lies in the future advancement of the UK's food packaging waste facilities. Whereas a more viable solution is the predicted inclusivity of design innovations. This is valid as innovation in the packaging sector is critical in producing new eco-friendly applications (Madl, 2021, [online]). Although, this also adheres to recent government-enforced sustainability policies, such as 'Extended Producer Responsibility' (EPR), making producers responsible for packaging throughout its life (Croner-i, 2021, [online]). Overall, food freshness and safety must be balanced with environmentally-sound packaging production.

4. The Future of Sustainability in the Food Packaging Industry

There are multiple solutions that support the sustainable future of food packaging. Whilst there was adequate information on this subject, finding concrete data on sustainable design practices within packaging proved more challenging.

According to *Edge2Edge* (2021a, [online]) – sustainable packaging company - key players are starting to make sustainable commitments that will demonstrate benefit over time. This includes the commercialisation of re-usable food packaging, evident in the collaboration between Loop and Burger King, set to incorporate 'reusable containers' into their menu. These partnerships within the production chain makes sustainability possible by filling gaps in their production or disposal processes. It is now more viable for retailers, especially since the non-recyclable packaging boycott, to work towards sustainability goals and meet market demand. Leading the way is John Lewis, and their pledge to make own-branded packaging completely 'recyclable, reusable, or home composed by 2023' (Internet Retailing, 2021, [online]).

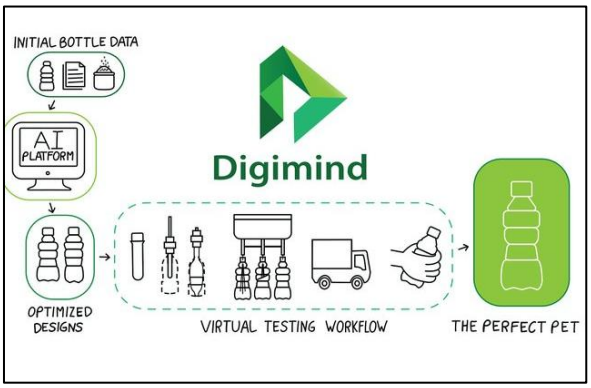
(*Edge2Edge*, 2021b, [online])

A diverging trend is the emergence of 'smart packaging', such as 'bio-polymers', as a biodegradable alternative to plastic. An article on the future of food packaging by MDPI (scientific journal database) also agrees this will enhance packaging's 'antimicrobial and light blocking properties' (Sani *et al*., 2021, [online]). However, COVID-19 may have hindered these efforts, despite the reduction of carbon emissions, as minimal industrial activity revealed drawbacks in our linear economy. Even the commercial potential of biodegradable and compostable packaging is limited by inefficient composting infrastructure (Duncan *et al*., 2021 [online]). However, GreenBiz (media against climate change) suggests this argument is only valid in the short-term impacts of smart packaging, rather than measured environmental benefits overtime. This drive for longevity is also present within the digital design industry, having arguably more successful measures that could be applied within the design of sustainable food packaging.

Design is key in innovating new products but is also regarded as most impactful to the environment (Curran *et al*., 2020, [online]), and therefore sustainability should be focused on this stage. This is conveyed by stakeholders introducing 'Eco-Design Principles (EDP)' and 'Product Service System (PSS) Models' (*Anthesis*, 2021, [online]). Whilst a traditional concept, eco-design is proving to be valuable for food packaging, as again illustrated by Loop. Their re-use initiative (PSS strategy) means leasable items can be monitored across the life cycle to minimize waste (Acaroglu, 2020, [online]).

Conversely, negative implications are more likely in the packaging manufacturing process (*Anthesis*, 2017, [online]). Although 80% of impacts are supposedly 'locked-in' with design, (Acaroglu, 2020, [online]), manufacturing by-products are increasingly harmful to the surrounding wildlife. This contrast illustrates the conflict within this research, however as mentioned throughout the review, true sustainability can be achieved by the application of strategies across all stakeholders (Curran *et al*., 2020, [online]). Although Eco-design is a core tool in circularity, its success is prohibited by several issues. LCA helps to decrease emissions (*Anthesis*, 2021, [online]) in a design process but is also a 'time and cost-intensive task' (*Anthesis*, 2017, [online]) that wouldn't be as commercially viable for the economic and social pressures already on the packaging industry.

Nonetheless, the digital design solution predicted to disrupt the market for sustainable packaging is artificial intelligence (AI) via the medium of CAD. Digimind ('Deep-Tech start-up'), are pioneering a platform to help creators achieve eco-friendly and low-cost packaging in one workflow (Packaging Europe, 2021a, [online]). This sets a good precedence for how sustainable design could be the catalyst the industry needs.



(Packaging Europe, 2021b, [online])

5. The Digital Design Industry & Sustainable Food Packaging

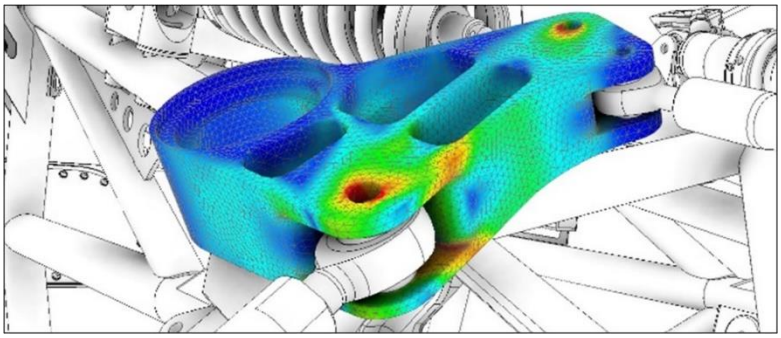
The constant sustainable development within the disciplines of digital media design could provide a closed-loop for each stage of food packaging production. The academic information around these themes were limited, revealing a literature gap. The only reliable sources were from industry and company platforms. According to an article on sustainable creative industries by the US Academy of Arts University, digital design is now more aware of its environmental impact.

Graphic design, traditionally consuming large quantities of paper/plastic, has shifted to more eco-friendly materials and printing chemicals. Similarly, industrial design has changed to create plastic-free products and packaging (Academy Contributor, 2020, [online]). These 'safe and sustainable' approaches are the most successful in the 'pre-market-design phase' (*EEA*, 2021, [online]). Also vocalised by Autodesk, the leader in CAD software products, that 80% of a product's environmental cost is 'locked-in' at conceptualisation (Fogel, 2021, [online]). Regardless, this consideration dismisses the responsibility of the entire UK industrial sector. Despite continued regulations, from EUR (Granskog *et al*., 2021, [online]) to the recent United Nations Conference of the Parties (Davy, 2021, [online]), a survey by the 'British Chambers of Commerce' (2020, [online]) revealed that two-thirds of businesses don't have a sustainability policy. In truth, the main catalyst for businesses, voiced in a paper from ScienceDirect (publication database) on packaging production, is pleasing consumers for economic gain (Civancik-Uslu *et al*., 2019, [online]).

The endless evidence on how well sustainability dimensions provide environmental and humanitarian benefits, demonstrates the generalised scope of the previous point. The strategies that best 'design-out' the negatives in food packaging production are Eco-design (Pigosso *et al*., 2019, [online]) and Life Cycle Analysis principles. In fact, when combined, it is easier to identify areas for EDP's to provide further environmental and economic gain (Civancik-Uslu *et al*., 2019, [online]). Nevertheless, the future influence of digital media practices will be hindered by several factors. Issues with ED methodologies, mentioned in other parts of this review, include how LCA is unable to measure the complete impact of packaging and products without all the 'indicators', like littering (Pires, 2021, [online]). Similarly, the extent of EDP's on a project's success is still unknown and can negatively

impact a project by increasing production costs, or depleting product quality (Pigosso *et al*., 2019, [online]).

Alternatively, the extent of the short-term problems with EDP's and similar initiatives are incomparable, as CAD is set to be part of the disruptive solution to bridge food packaging and sustainability. CAD covers multiple disciplines, from product design to architecture, that involve the use of highly efficient (Yong, 2021, [online]) computer systems (Flynt, 2019, [online]). CAD contributes to the sustainable merit of a project via the mediums of Building Information Modelling (BIM), Finite Element Analysis (FEA) and Generative Design (GD). BIM is a workflow tool that contains information about a model from design to build (*Autodesk***,** 2021a, [online]), and according to an established UK Architectural Firm, provides sustainable benefits by indicating economic and environmental costs. Indeed, the future of BIM (A-BIM) will involve AI and 'algorithmic design' (AD) to generate simulations that replicate a projects ecological impact (*Quattro Design*, 2021, [online]).



FEA - (*Autodesk***,** 2021b, [online])

This shows how the negative impacts in the early design stage can be combated. Autodesk also promotes the opportunity to design-in environmentally-sound features via Generative Design (GD) and FEA software environments. Where AI models numerous versions of one design, or even better for packaging design, FEA performs multiple simulations and tests all within one step (Fogel, 2021, [online]). Therefore, a viable product can be executed without touching real life resources and funding but can also be implemented into today's practical (CAM) and digital (CAD) processes in the packaging industry. The only barrier is that CAD is cost intensive, from software packages to technology with the latest processing power (Flynt, 2019, [online]). Unfortunately, excessive cost is already hindering packaging producers from

investing in more eco-friendly methods and R&D. In the progress to sustainable production, economic viability is a greater variable than previously thought.

CONCLUSION

Overall, this report has explored, in line with the aims and objectives, the topic of sustainability and packaging. Sustainable design practices could be applied within the context of the food packaging industry, especially with the normalisation of AI, as a solution for a more circular economy. The report also revealed how insufficient recycling infrastructure and consumer awareness in packaging disposal are impeding on current efforts against linear production. This suggests resolving these issues is equally important for the success of future sustainability initiatives, through more quality education for consumers to understand how to better dispose of packaging. Or stronger innovation by end-of-life stakeholders for regenerative facilities that can process packaging alternatives.

The diversity of these outcomes has measurable value to thesis question, but also provides a convenient shift into structuring the primary research. This will allude to unanswered questions and reveal new perspectives for this study and continue to enlighten a personal passion for sustainability and packaging.


Methodology

SECONDARY RESEARCH (Semester 1)

The information in this report was from a diverse range databases and industry credible websites, to maintain the relevance and clarity of the report. The efficiency of this process was maintained by Google Drive to organise sources, Mendeley to cite these findings, and Microsoft Excel as a means of time management. The depth of topics discussed meant time management was vital, through a successful combination spreadsheets - a calendar (**Appendix A**) to schedule tasks, and a Gantt chart to track challenges and milestones (**Appendix B**). In the event of losing access to broadband and benefits of the university library databases, all sources were also organised and referenced in Microsoft Word.

PRIMARY RESEARCH (Semester 2)

The preparation for the primary research is key for writing the rest of the dissertation. Previous experience in primary exploration (RSA case study), revealed that methods, such as interviews, surveys and concise questionnaires are the best for fuelling a diverse discussion and analysis. The best resources to execute these methodologies will be Google Forms and an established email template in Microsoft Outlook. The planning and monitoring of this process will be achieved via Microsoft Excel (similar the secondary strategy). **Appendix C** shows a timeline for writing each section, and a detailed calendar (**Appendix D**) to help with overall preparedness for the next semester.

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APPENDICES

Appendix A

MONTH/DAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY	WEEK
OCTOBER	11th	12th	13th	14th	15th	16th	17th	4
			Source & Reference	Organise & Prepare				
	18th	19th	20th	21st	22nd	23rd	24th	5
			Source & Reference	Organise & Prepare				
	25th	26th	27th	28th	29th	30th	31st	6
	Source & Reference	Organise & Prepare					Organise & Prepare	
NOVEMBER	1st	2nd	3rd	4th	5th	6th	7th	7
	Source & Reference					Organise & Prepare		
	8th	9th	10th	11th	12th	13th	14th	8
			Source & Reference	Print Out Research Tables	Identify Key Trends, Anomolies. (AREAS & ALL DATA)		Type Up Results and Plan next Steps	
	15th	16th	17th	18th	19th	20th	21st	9
			Summarise each area SET OUT PARAGRAPH STRUCTURES					
	22nd	23rd	24th	25th	26th	27th	28th	10
	Literature review (1st Point)		Literature review (2nd Point)		Literature review (3rd Point)	Literature review (4th Point)	Literature review (5th Point)	
NOV/DEC	29th	30th	1st	2nd	3rd	4th	5th	11
	Literature review (5th Point)	Peer Review						
DECEMBER	6th	7th	8th	9th	10th	11th	12th	12
	Methodolgy		Time Management Visuals					
	13th	14th	15th	16th	17th	18th	13	
	Conclusion			Final Check & Submit	Semester 1 Over/ RESEARCH REPORT DUE	XMAS BREAK!!!		

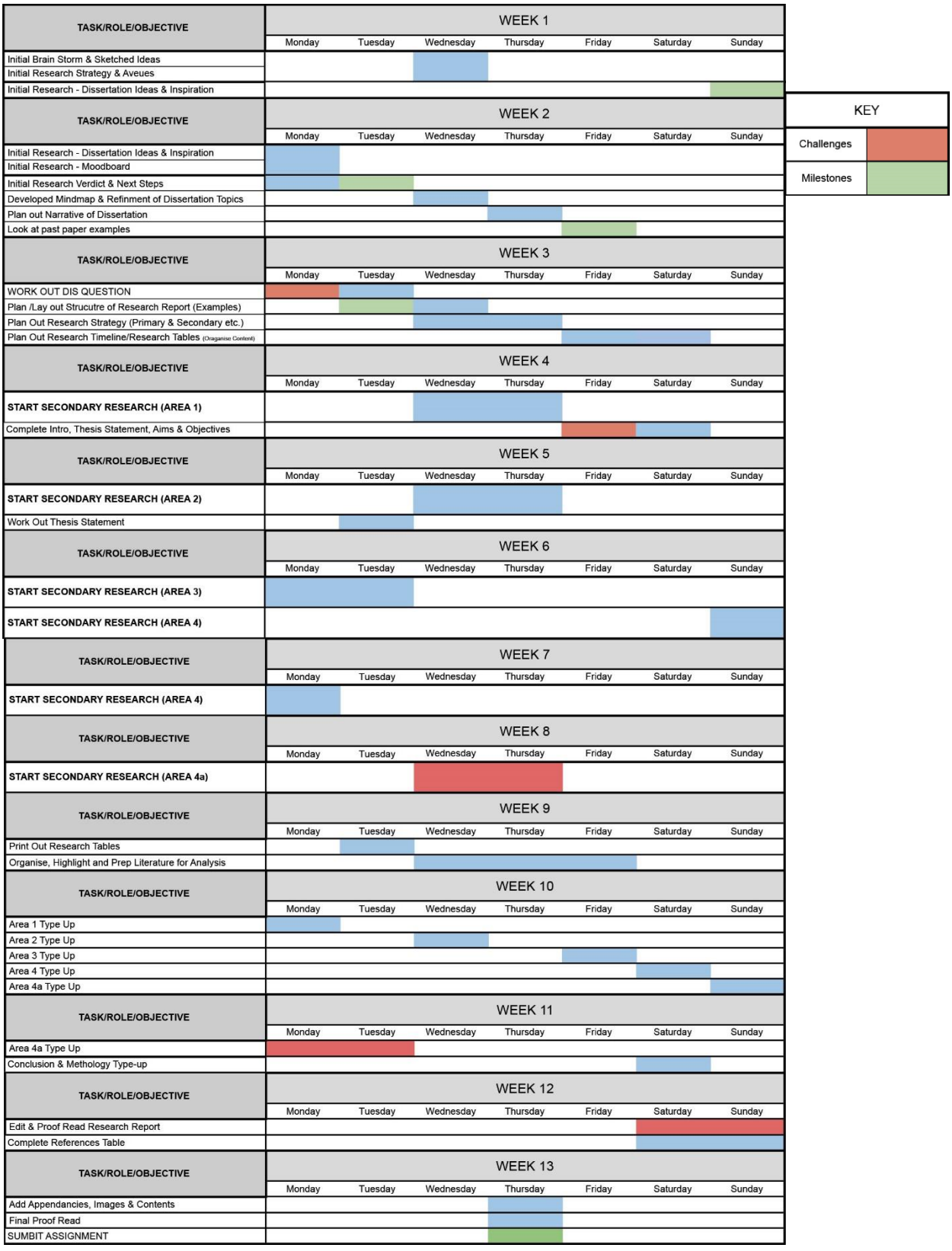
KEY	
On Campus	
RESEARCH TOPIC 1	
RESEARCH TOPIC 2	
RESEARCH TOPIC 3	
RESEARCH TOPIC 4	
RESEARCH TOPIC 5	
Type Up/Proof etc.	

Appendix A shows the task manager for semester one. This helped to organise the entire process of writing the research report from start to finish. It also made the overall experience less stressful than it would have been without this management in place.

Appendix B

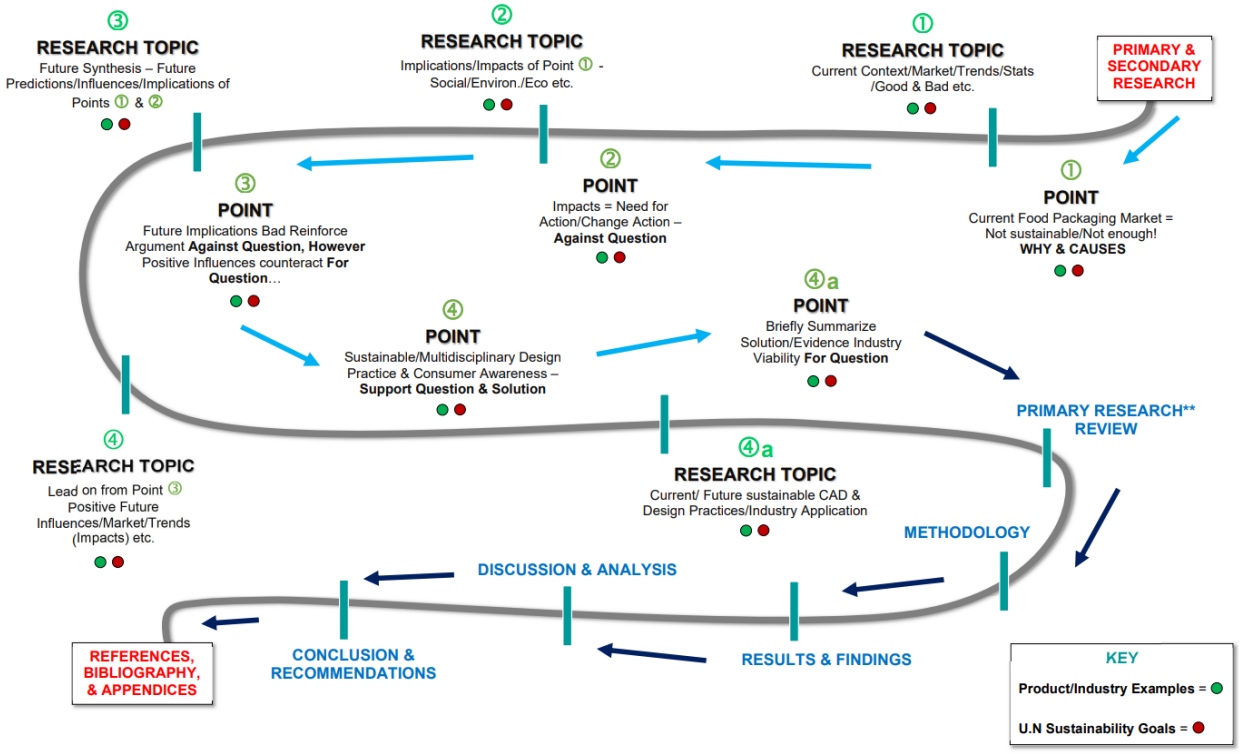
Appendix B (below) shows the semester one Gantt Chart for the research report module. This lists every task, from week one until submission, carried out in the journey of completing the assignment. The colour code shows tasks along the way that were challenging, or a key milestone that enhanced the work process. The biggest hurdles were working out the thesis question, researching literature on CAD and packaging, and cutting down the word count before submission.

These challenges were tackled via various solutions, including preliminary research to help work out the thesis question, using Boolean terms to refine research results, and taking the time to read through a draft of this document to identify any parts that weren't critical for the outcome of the report.



Appendix C

Appendix C depicts a visual timeline produced to lay out the components within the research report, as well as the entire structure of the dissertation. This was helpful during the literature review because it kept each topic to a point and in chronological order for critical discussion. The diagram will also be of benefit in semester two, even improved on, to help shape the next stages.



Appendix D

Appendix D (below) follows the same functionality of the calendar for the semester one time management (**Appendix A**). Accept, this shows the allocated preparation time to organise and research (if necessary) the assets to help begin the primary exploration in semester two. At this point it will also be key to consider if any ethics procedures will be relevant to the planned methodologies, such as surveys and video interviews.

MONTH/DAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY	WEEK
DECEMBER/JAN							19th	HOLIDAY
	20th	21st	22nd	23rd	24th	25th	26th	
						CHRISTMAS	BOXING DAY	
	27th	28th	29th	30th	31st	1st	2nd	
JANUARY	3rd	4th	5th	6th	7th	8th	9th	HOLIDAY
	10th	11th	12th	13th	14th	15th	16th	
	Plan Primary Research	Prep Secondary Research	Prep for Semester Two					
	17th	18th	19th	20th	21st	22nd	23rd	
	24th	WEEK 1						
	SEMESTER TWO START							

KEY	
Plan Secondary Research	
Prep Secondary Research	