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# Disrupting industrial systems:

# A strategic management approach to capturing uncaptured value of unused space capacity

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## Abstract

Advanced technologies provide data about how capacities are used, disrupt operational processes and cause demand for capacities to change. This research investigates how advanced technologies affect capacity utilisation of teaching space at Cambridge University (CU) intending to identify how capacity utilisation of teaching space can be managed strategically in order to capture uncaptured value inherent in unused capacity. Furthermore, the investigation studies how incorporating sustainability into managing space capacity affects global supply networks and the industrial systems associated with the production and operation of space capacity. The theory employs literature from the fields of sustainable business model innovation, strategic management, supply chain design and capacity utilisation of teaching space, using a broader economic and strategic management perspective. Quantitative methods are conducted to identify the value uncaptured, and quantify the extent of unused capacity. The paper concludes with summarising managerial implications linked to improving efficiency and effectiveness of investments and resources in order to decrease the need to invest new capital carbon.

Keywords: capacity utilisation; sustainable business model innovation; strategic management; uncaptured value; supply chain management

## 1. Introduction: tackling the carbon challenge

Supply and demand of space capacity and the use of the built environment impose enormous pressure on the planet's limited natural resources. Utilising space accounts for a remarkable carbon footprint. Leaving space capacity unused is unsustainable. Globally, the processes associated with the built environment account for 33% of greenhouse gas emissions, more than 40% of energy use (Peng, 2016, p.453) and, within the European Union, the use of over 50% of all extracted materials (European Commission, 2011). Thus, the incorporation of sustainability into the international supply network and industrial system involved with the production and operation of space capacity, and services linked to it, gain ever more importance.

Within the UK, the construction sector accounts for approximately 6% of the GDP, the production sector equates to 14% (Office for National Statistics (ONS), 2017). Allwood and

Cullen (2012) demonstrate for the UK, changes in the gross domestic product (GDP) are closely coupled with annual carbon emissions changes, as shown in figure 1-1.

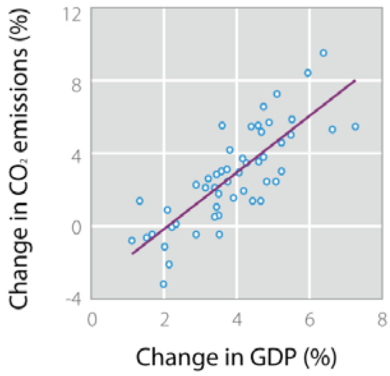


Figure 1-1 The relationship between changes in the UK's GDP and changes in the UK's annual CO2 emissions (source: Allwood and Cullen, 2012, p.261)

As seen in figure 1-2, using fewer resources per unit of economic output increases the efficiency of resource utilisation; this is called *resource decoupling* (UNEP, 2011). Increasing economic activity and decreasing environmental impacts is essential for mitigating threats of "toxic emissions" (ibid., p.6); this is called *impact decoupling*. Sustainability demands decoupling economic growth and society's well-being from absolute resource consumption (Schandl et al., 2016; UNEP, 2011). Sustainability, however, relates to the systemically linked capital domains of *natural capital* and *economic capital* and the *human domain*. A sustainable performance, therefore, refers to environmental performance, organisational economic performance and social performance (Evans et al., 2017). Decoupling will demand substantial changes of policies, organisational behaviour and human consumption patterns (UNEP, 2011).

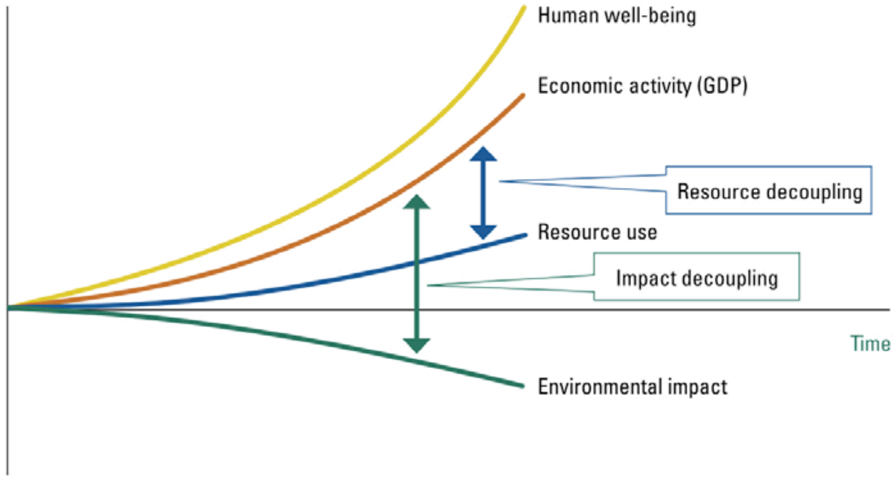


Figure 1-2 The relationship of economic activity (GDP), human well-being, resource decoupling and impact decoupling (source: UNEP, 2011, p.5)

Consequently, the purpose of this study is to investigate the extent of *unused* capacity and its implications for sustainability. This investigation intends to discover how space capacity utilisation can be managed strategically in order to capture uncaptured value inherent in unused capacity.

Using a broader economic and strategic management perspective, the research aims at discovering whether capturing value from idle capacity increases efficiency and effectiveness of investments and resources in order to decrease the need to invest new capital carbon.

## 2. Theoretical background

### *2.1. Capacity utilisation of teaching space at universities in the UK: demand growth and resource provision*

Global demand for tertiary education is increasing. Based on current data from the World Bank, figure 2-1 illustrates the total enrolment in tertiary education as it developed from 1970 to 2015 globally. In 2015, over 35% of those leaving secondary school continued to tertiary education. The number doubled compared to the end of the 20th century (World Bank, 2017).

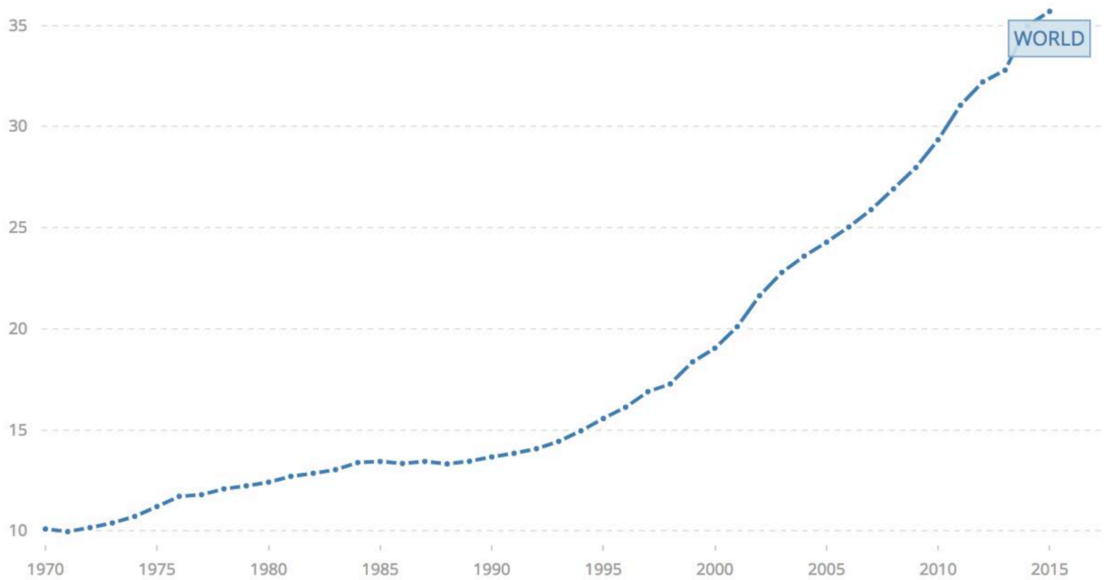


Figure 2-1 Total enrolment in tertiary education, regardless of age, expressed as a percentage of the total population of the five-year age group following on from secondary school leaving (source: World Bank, 2017)

Correspondingly, UK universities steadily invest more money in space: according to the AUDE Estates Management Report (2016), the non-residential capital expenditure for higher education (HE) buildings constantly rose from about £1.6 billion in 2004/05 to about £2.75 billion ten years later. However, both carbon and financial expenditures for unused capacity are significant: for 2003/04, the average UK university teaching space utilisation ratio was 27%

(Space Management Group, 2006). Consequently, for every square metre used, 3.7 sqm were provided; low levels of capacity utilisation result in high opportunity costs to facilitate a given activity (ibid., p.17).

In order to calculate the opportunity cost of low capacity utilisation, space provision and cost of space can be linked (Space Management Group, 2006). Accordingly, figure 2-2 illustrates that the relationship between the capacity utilisation of teaching space and both space provided and cost is non-linear. Increasing the utilisation rate by 5 percentage points (p.p.) from 5% to 10% halves the total square metres required for each square metre in use and the cost expended (Space Management Group, 2006). However, increasing the utilisation rate by 5 p.p. from 30% to 35% cuts the total square metres required for each square metre in use far less, namely by only 12% (ibid.). Thus, increasing low capacity utilisation rates impacts resource consumption and capital and operational cost expenditure substantially.

| Utilisation rate % | Total $m^2$ provided for each $m^2$ in use | Sustainable estate provision for each $m^2$ in use (£) | Total estate provision for each $m^2$ in use (£) |
|---|---|---|---|
| 5 | 20.0 | 3,248 | 4,306 |
| 10 | 10.0 | 1,624 | 2,153 |
| 15 | 6.7 | 1,083 | 1,435 |
| 20 | 5.0 | 812 | 1,077 |
| 23 | 4.3 | 706 | 936 |
| 25 | 4.0 | 650 | 861 |
| 27* | 3.7 | 601 | 797 |
| 30 | 3.3 | 541 | 718 |
| 35 | 2.9 | 464 | 615 |
| 40 | 2.5 | 406 | 538 |
| 45 | 2.2 | 361 | 478 |
| 50 | 2.0 | 325 | 431 |
| 55 | 1.8 | 295 | 391 |
| 60 | 1.7 | 271 | 359 |
| 70 | 1.4 | 232 | 308 |
| 80 | 1.3 | 203 | 269 |
| 90 | 1.1 | 180 | 239 |
| 100 | 1.0 | 162 | 215 |

Figure 2-2 The inefficiency multiplier linking utilisation rates, space provision and cost of space (source: Space Management Group, 2006; * EMS reported sector median (data 2003-04))

### 2.2. Disruption calling for change: uncovering unused capacity

Balancing economic, environmental and social aspects and interests of all stakeholders for achieving a sustainable performance is especially valuable to organisations that aim for a long-term strategy (Ortiz-de-Mandojana and Bansal, 2016). Universities often exist for centuries and commit to benefitting society and future generations through teaching and research. Thus, universities mostly strive for long-term strategies. A long-term strategy for resilience, however, requires upfront investment to align the organisational focus (Winston et al., 2017). Moreover, organisational identity is challenged through sustainability, as sustainability in itself is disruptive (Kiron et al., 2017, p.7; quoting Ioannou). Hence, striving for sustainable performance entails disruption.

According to Christensen and Eyring (2011) the disruption impacting the HE sector has been caused by disruptive new technologies. The advent of online learning provoked change because value propositions that have not yet been established in a sector bring disruptive innovations (Christensen, 2013). Organisational structures and competition are particularly affected by advanced technologies because digital tools enable transparency and open up the organisational structure to "public scrutiny" (Winston, 2016, p.3). Transparent data flows unveil interconnections and interdependencies; data collection and analysis reveal resource capacity embodied within operational processes (Nyquist et al., 2016). Unused resource capacity can be used to provide more services without investing in more material (Allwood and Cullen, 2012, p.256). For universities, increasing space efficiency requires re-allocating space resource capacity between several involved stakeholders. This is especially true for collegiate universities (Fleming et al., 2012). Sharing resources between several stakeholders, however, implies trading-off interests: sharing resources, goods or space limits availability and convenience (Allwood and Cullen, 2012). Plus, integrating different operational procedures, and practices, can be ambiguous and difficult (Cuijpers et al., 2011). Practices change only with behaviour reflection because "ingrained character patterns" form the way a new practice is brought into action (Kets de Vries et al., 2013, p.81). Consequently, structural change requires organisations to claim new strategic positions (Porter, 2008).

Hence, advanced technologies uncover unused resource capacity embodied within operational processes. Unveiling uncaptured value, digital tools disrupt established organisational structures, and cause practices to change.

### 2.3. Capturing uncaptured value embodied in operational processes: affecting established systems

Identifying uncaptured value enables organisations to understand aspects of their business models that are not yet designed sustainably (Yang, Evans, et al., 2017). Therefore, innovating business models for sustainability integrates sustainability "as a central element of the business itself" (Yang, Vladimirova, et al., 2017, p.31).

So far, sustainability is often regarded as an addition (ibid., p.30), for example with regard to energy efficiency measures for buildings. Furthermore, human behaviour and socio-economic influences affect the efficacy of added measures: "when people get involved in the design […] or the operation of buildings" the effectiveness of energy efficiency measures changes (Gram-Hanssen and Georg, 2018, p.7). Contrarily, incorporating sustainability into business model innovation creates opportunities to *capture value* across the entire life cycle of a product and employs sustainability as a "core source of value" (Yang, Vladimirova, et al., 2017, pp.30, 31). Integrating sustainability into business models requires value networks designed to incorporate tangible and intangible economic, social and environmental values and to balance interests and responsibilities of multiple stakeholders to create mutual value (Evans et al., 2017, p.605). However, to balance interests and critical aspects that influence business models and to develop a performance strategy, multiple strategic objectives have to be considered: strategic objectives grouped within the perspective of internal business processes management, the financial perspective, the customer perspective and the perspective of innovation and growth all influence business strategies (Kaplan and Norton, 1996).

Seen from the value uncaptured perspective developed by Yang, Evans, et al. (2017, p.1797), the uncaptured value inherent in unused space capacity represents *value missed*, caused by the assets being underutilised. As illustrated in figure 2-3, the framework utilises identified negative forms of value to develop value opportunities that can than be turned into new business models, and create and capture new value. Hence, advanced technologies that make data flows transparent enable organisations to respond to the disruption and develop new business models for capturing uncaptured value. The demand for space capacity changes, causing the established industrial system, and the market structure to transform.

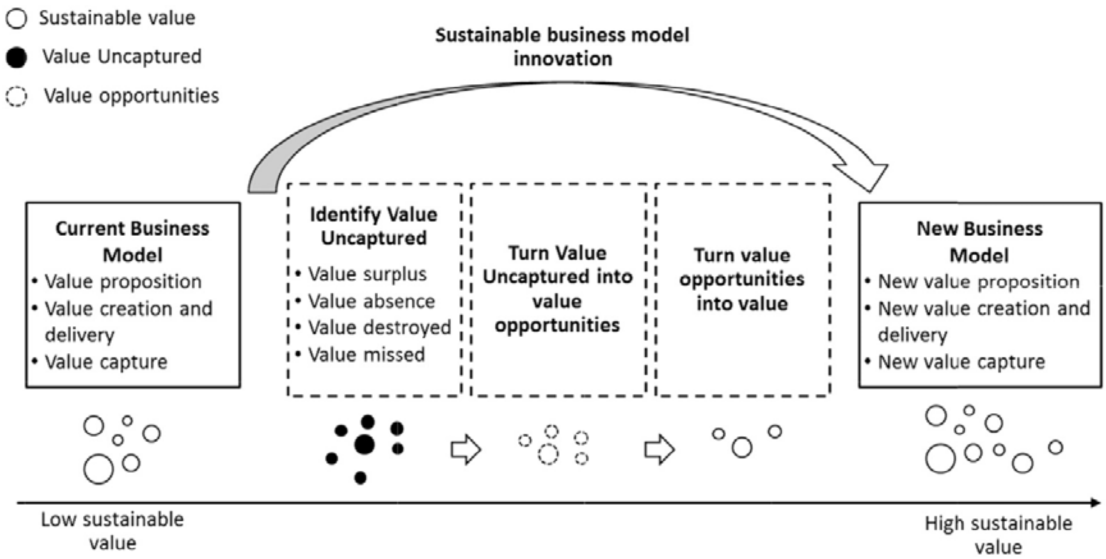


Figure 2-3 Framework developed by Yang, Evans, et al. (2017): using value uncaptured for sustainable business model innovation

## 2.4. *Transforming market structure: implications*

For space capacity, data transparency about supply, demand and capacity utilisation affects how those involved in the system interact. Full transparency about supply and demand of products and how customers use them enables firms to change how they interact with their customers: relationships become “continuous and open-ended” (Porter and Heppelmann, 2015, p.99). For the supply chain to adapt to the changing demand, continuously providing data on supply and demand changes to partners builds agility and enables companies to respond appropriately (Lee, 2004). Companies can offer their products as services, and develop new business models (ibid., p. 105).

To respond to structural market shifts caused by changing demand, companies need to align the supply chain design to adapt to the market and accommodate changes (Lee, 2004, p.4): sharing risks, cost and gains of supply chain improvements to increase the end-to-end performance creates mutual value (cf. Evans et al., 2017, p.605), and provides companies with sustainable competitive advantage (Lee, 2004, p.3). Long-term competitive advantage hence requires the supply chain configured to manage supply-demand dynamics effectively (Gaur et al., 2017). Accordingly, the supply chain design needs to incorporate sustainability, as major stakeholders increasingly demand strong economic *and* environmental and social performances from companies (Genovese et al., 2017). Employing advanced technologies and the data generated to integrate sustainability into business strategies, however, radically restructures the system companies are embedded in (Porter and Heppelmann, 2015): in their case study on insulation materials, Nasir et al. (2016) demonstrate the material manufactured within a circular supply chain to emit less carbon than the material produced within a supply chain designed linearly. Circular supply chain design hence is concerned with resource decoupling (cf. UNEP 2011), remanufacturing product components and re-using materials creating a “self-sustaining production system” (Genovese et al., 2017, p.355) .

Consequently, a circular supply chain is more efficient in terms of resource consumption per unit of economic output, and thus, increasing efficiency and effectiveness of investments and resources and more resilient in the long-term. Improving resource efficiency as well as energy efficiency, the shift to a services-based system will drive increased revenue and reduce carbon emissions (Porter and Heppelmann, 2015).

## 3. Methodology

### *3.1. Appropriateness and rationale for choice of case*

CU is deployed as a case because CU pursues a long-term strategy and is strongly committed to sustainability (University of Cambridge, 2016). As depicted in the literature review, long-term strategies are fundamental to sustainable development goals. The capacity utilisation of teaching space is supposed to be the lowest compared to other space types at CU (University of Cambridge, 2016, p.42). Hence, for analysing capacity utilisation of space, teaching space at CU represents a strong atypical case in order to understand the general problem. Atypical cases are strategically important to the research and critical to the understanding of the general problem (Flyvbjerg, 2006, p.229).

### *3.2. Research design*

The research design is based on a quantitative approach applying two methods: firstly, secondary data from technical and strategic reports and online databases is deployed in order to analyse the interrelation of carbon emission reductions and the demand for space at CU. Subsequently, space use frequency and occupancy data gained from 3D-room monitoring is collected for investigating capacity utilisation of teaching space at CU. Access to the live data online database was granted to the author by Cambridge University Estate Management (CUEM). Thereafter, the data is quantitatively analysed using spreadsheet analysis.

### *3.3. Limitations*

Findings are limited to the case investigated and to the specific type of capacity studied. Hence, identified correlations between carbon emissions, capacity utilisation, uncaptured value and operational processes can only tentatively be classified as general. Moreover, correlation does not necessarily imply causal link.

The research study proves the phenomenon's existence, and the need for further research to explore this on a broader basis. More evidence is needed in order to verify and support the findings.

In addition, as digital monitoring of space capacity utilisation is an emerging technology, the reliability of the data gained from it might still be limited.

## 4. Quantitative analysis of carbon emission reduction and demand growth

CU aims at reducing absolute carbon emissions by 34% from 2005 levels by 2020 for Scope 1 and 2 emissions from activities not associated with scientific or technical research (University of Cambridge, 2010, p.38).

As shown in figure 4-1, the gap between actual carbon emissions and predicted target trajectory constantly increased. Within ten years the total amount of carbon dioxide equivalent ($CO_2e$) emitted grew by about 10,000 tonnes. This is a growth by roughly 12.5% from 2004/05 to 2014/15, corrected for weather effects like temperature and barometric pressure. With regard to the 34% target trajectory, the carbon emitted in the academic year (AY) 2014/15 should have been totalling to approximately 58,000 tonne of $CO_2e$ ($tCO_2e$). That would have been a decrease by approximately 20%. Particularly, the increase of the size of the estate impedes adhering to the target trajectory (University of Cambridge, 2016, p.35). The growth of the estate can be seen as the “key driver” to increasing absolute carbon emissions (ibid.).

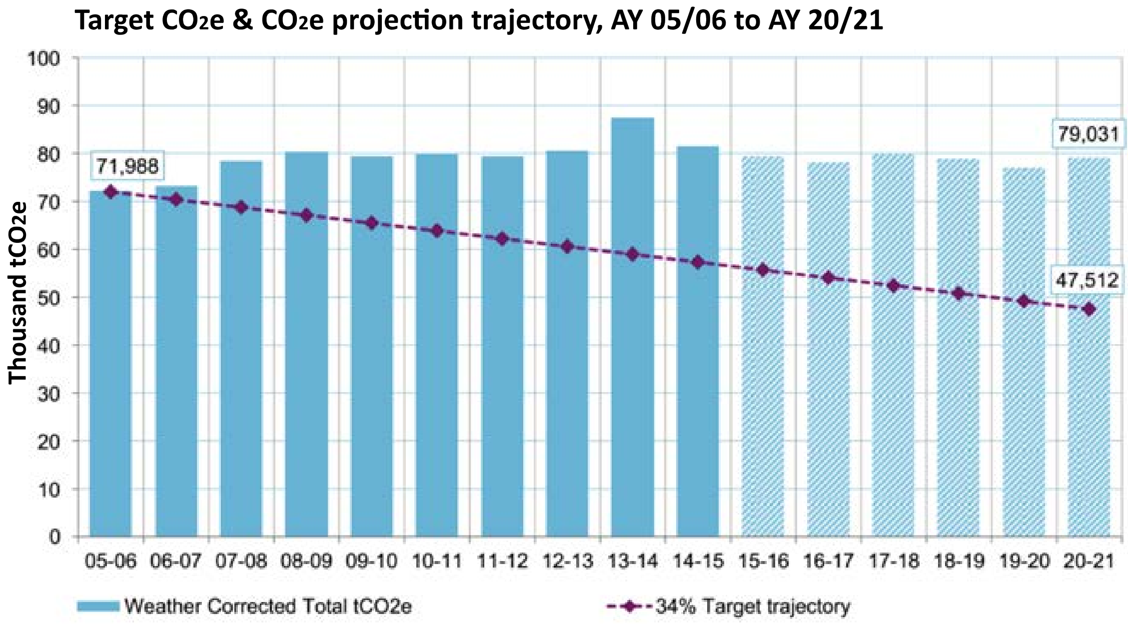


Figure 4-1 CU Scope 1 & 2 emissions, academic years 2005/06 to 2014/15 with estimated future emissions up to 2020/21 and target trajectory required to achieve the 2020 target included in the Carbon Management Plan (source: AECOM Sustainable Development Group, 2016, p.4)

However, figure 4-2 illustrates how carbon emissions per unit of economic income from funding body and research grants and contracts decreased from 2005/06 to 2015/16. The graph shows how $CO_2e$ emissions can be framed respecting continued growth by setting carbon emissions against a growth metric based on income (cf. University of Cambridge, 2010, p.36). Correspondingly, this is what is defined as *resource decoupling*: less energy has been used per unit of economic output (cf. UNEP, 2011). However, this does not consider absolute emissions and hence, does not comply with the set targets. As shown in figure 4-2, the overall emitted $tCO_2e$ decreased from 2013/14 to 2015/16. Yet, the carbon emitted in 2015/16 still amounts to 108% compared to the 2005/06 baseline. Set against the target trajectory shown in figure 4-1, the $tCO_2e$ emitted in 2015/16 should have decreased to about 78% of the amount of carbon emitted ten years earlier. Thus, in 2015/16 the gap between targeted and actual total carbon emissions was approximately 30%.

For the same decade, figure 4-2 further illustrates the amount of students increased by roughly 6%, whereas the headcount of staff even rose by 28%. As the spatial capacity provided per user (students and staff) remained nearly unchanged, the estate grew by about 15% during that period.

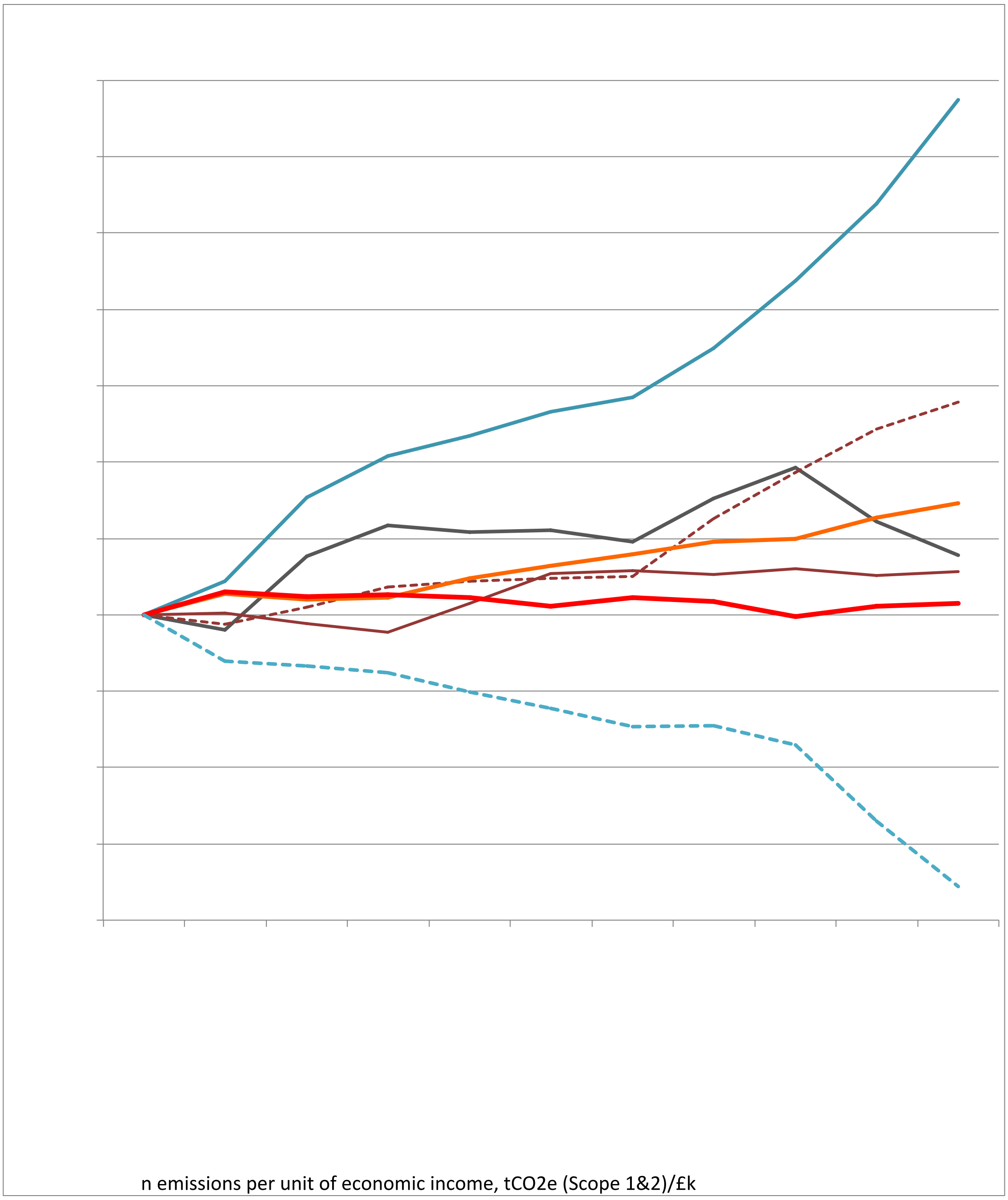


Figure 4-2 Development of income (from funding body and research grants and contracts), carbon emissions, estate size (net assignable area, NAA), and users (FTE student load comprising undergraduate and postgraduate students (taught and researching) as well as headcount of staff), development of area-per-user ratio and carbon emissions per unit of economic income. Development from 2005/06 to 2015/16 at CU.

## 5. Quantitative analysis of capacity utilisation of teaching space at CU and unused space resource capacity

### *5.1. Measuring capacity utilisation of teaching space at CU*

CUEM has equipped particular spaces across the estate with 3D-cameras. The 3D-cameras monitor the rooms and count the people using that room but do not identify them. The data gained from the 3D-cameras is real time data containing information on frequency as well as occupancy of space usage. The frequency of space usage refers to how often a space is used in relation to the available time; the occupancy of space use refers to how many people are using that space in relation to its capacity. The multiplication of frequency and occupancy equals the capacity utilisation ratio.

For all sets of data generated from the database, the parameters for the daily period monitored were set to 9 a.m. until 6 p.m. This restriction allows the investigation to focus on the main usage period. Data sets were generated for a whole year for every day in order to investigate potential usage differences over the course of the year. Furthermore, the inquiry concentrates on CU's West Cambridge Site. Spaces monitored in West Cambridge are relatively new. Hence, any potential changes to CUEM policies, sustainability or energy regulations or any other regulations that affect the configuration and the efficiency of space are most likely to be reflected in those spaces. Additionally, it must be considered that new buildings are mostly designed to accommodate future growth, and therefore may appear under-utilised in the early years. As digital monitoring of capacity utilisation of space is a new technology, there is only limited data about past AYs available.

### *5.2. Analysis of capacity utilisation of teaching space at CU*

As shown by figure 5-1, the capacity utilisation for teaching space at West Cambridge is higher during terms than between terms. Moreover, the red average graph illustrates that Michaelmas term 2016 featured a higher capacity utilisation than Lent term and Easter term. Seemingly, the highest average level was reached at the beginning of Michaelmas term, followed by a decline over the course of the term and concentration on a slightly higher level towards the end of the term. Lent term seems to have been featuring a similar trend, albeit, on a lower level. Easter term featured by far the lowest average capacity utilisation. Between the terms, however, the capacity utilisation remained on a very low level close to zero.

Yet, some rooms featured capacity utilisation beyond their maximum capacity: Lecture Theatre 1 (ARG41) accounted for 149.6% on October 13$^{th}$ 2016, Goldsmiths 2 (00.015) capacity utilisation was 113% on December 13$^{th}$ 2016. When spaces are used to more than 100% of their capacity, more users are within the space at the same time than intended.

The yearly average capacity utilisation is 3.5%; compared to the peak utilisation of individual rooms the yearly average is low.

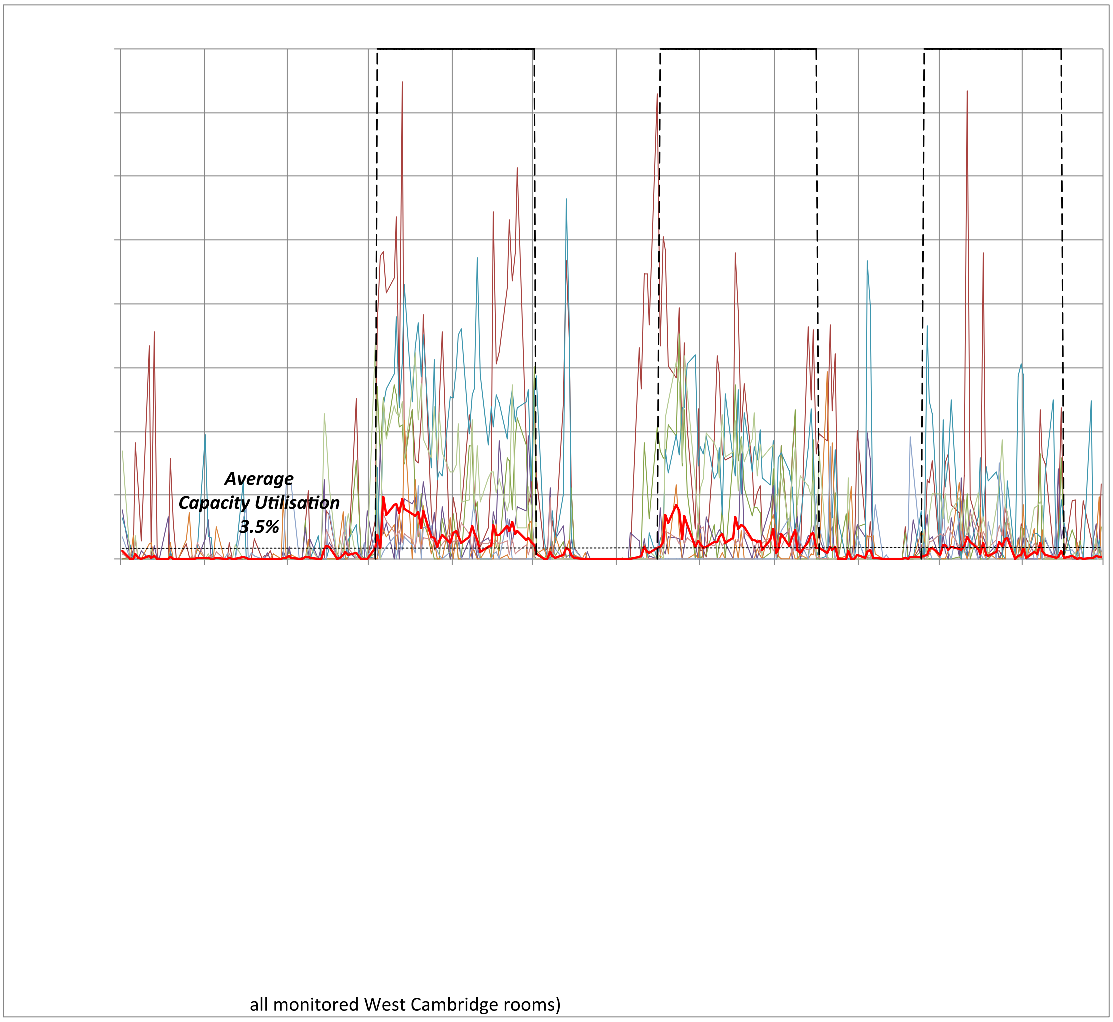


Figure 5-1 Capacity utilisation of teaching space at West Cambridge (all monitored rooms), 1st July 2016 to 30th June 2017

## *5.3. Analysis of unused capacity of teaching space at CU*

Illustrating the uncaptured value inherent in unused resource capacity, figure 5-2 displays the unused capacity of all monitored West Cambridge teaching spaces between 09:00 and 18:00. Over the year, 92% of the spaces' capacity remains unused. During terms, the degree of unused capacity decreases by approximately 5 p.p. to 87%. However, during Michaelmas term, West Cambridge lecture theatres are used to the highest degree of their capacity: their average unused capacity is about 83%. In the mornings, the average unused capacity goes down to as low as 71% during Michaelmas term. This trend is true for the whole-year average and the average for all three terms. During middays, the average unused capacity peaks at around 90%. In the afternoons, the average unused capacity drops again. However, it decreases only to 83% during Michaelmas term. Thus, the ratio of unused capacity of all monitored West Cambridge rooms fluctuates between about 70% and 95%.

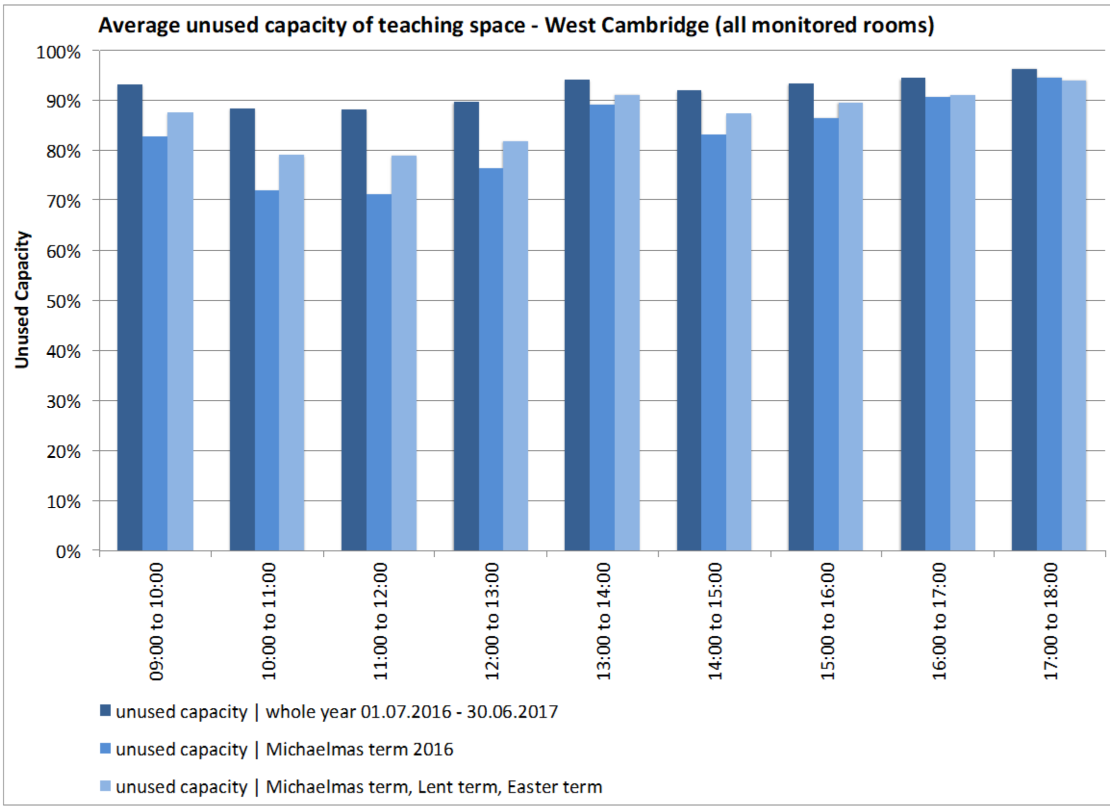


Figure 5-2 Average *unused* capacity of teaching space at West Cambridge (all monitored rooms), 09:00 to 18:00, 2016/17

## 6. Discussion

The analysis demonstrates for the year under investigation and the monitored West Cambridge rooms that 3D monitoring of space capacity unveils unused resource capacity embedded in operational processes. The advanced technology in use generates live data and transparency about how users demand space capacity. The analysed and processed data uncovers the uncaptured value inherent in idle capacity.

The literature review exposed the opportunity costs coupled with unused capacity and the potential from increasing low capacity utilisation rates. As the analyses reveal that the average capacity utilisation at West Cambridge is low, carbon and financial capital expenditures, as well as operational expenditures linked with unused capacity are significant. However, the chart showing the unused capacity illustrates economic, environmental and social potential for development. Future growth can be accommodated in existing capacity, increasing efficiency and effectiveness of investments and resources and decreasing the need to invest new capital carbon. The underutilised assets represent value missed that can be turned into value opportunities capturing the uncaptured value.

According to the literature, capturing new value requires strategically balancing interests and responsibilities of multiple stakeholders. Then, the new value proposed incorporates tangible and intangible economic, social and environmental values, and creates mutual value (cf. Evans et al., 2017). Capturing uncaptured value inherent in unused space capacity hence requires strategically developing benchmarks defining the extent to which the unused capacity shown in figure 5-2 can be turned into new value without compromising interests of involved stakeholders.

However, making resources available to several stakeholders entails trading-off interests, and limits availability and convenience (cf. Allwood and Cullen, 2012). On the other hand the analysis demonstrates the gap between targeted and actual total carbon emissions to account to approximately 30% in 2015/16. As mentioned in the literature, the shift to a services-based system improves resource and energy efficiency reducing carbon emissions. The analysis reveals that demand and supply of new space are key drivers for the total carbon emissions of CU to rise. In contrast to the area per user ratio not changing for a decade as shown in figure 4-2, the shift to a service-based space capacity provision will cause the ratio to decline. Resources and energy will be used more efficiently, facilitating the total carbon emissions to decrease. The demand for space capacity will change, disrupting the industrial system producing, operating and servicing teaching space capacity, and causing the supply network to transform.

## 7. Conclusion

### *7.1. Managerial implications*

Regarding the disruption caused by advanced technologies uncovering unused space capacity, organisational strategies have to be aligned strategically balancing interests and responsibilities of all involved stakeholders. To meet their interests, benchmarks have to be developed defining the extent to which unused capacity can be turned into new value. The benchmarks then reflect mutual value comprising all stakeholders' interests.

The innovated business model will comprise three core principles: organisations' spaces being managed centrally across departments and institutions, employing new technologies to monitor capacity utilisation and a services-based system to share the mutual value between stakeholders, and users. The sustainable business model will then capture uncaptured value, improve efficiency and effectiveness of investments and resources as well as energy consumption, and hence, drive increased revenue and contribute to total carbon emission reduction.

Regarding the supply networks and the industrial system associated with the production, operation and servicing of space capacity, the research demonstrated that advanced technologies employed to uncover unused capacity will lead to changing demand for capacity. As venturing to employ idle capacity requires less resources and more service, companies need to ensure their supply chain is agile to adapt to the radical shift in the market. Firms need to align their supply chain to share risks, costs and gains to achieve long-term competitive advantage.

### *7.2. Future research*

Future research should quantify the impact on supply chains and industries associated with the supply and operation of space, and the economic potential arising from capturing uncaptured value of unused capacity. Furthermore, more cases should be employed that investigate different types of organisations, and other types of capacity.

Moreover, future research would have to focus on balancing critical aspects, interests and responsibilities of involved stakeholders to develop and test benchmarks that define the extent to which unused capacity can be turned into new value.

### *7.3. Decarbonising capacity utilisation: reshaping the value chain*

This research studied capacity utilisation of teaching space at CU identifying how capacity utilisation of teaching space can be managed strategically in order to capture uncaptured value inherent in unused capacity. Furthermore, the study investigated how incorporating sustainability into managing space capacity affects global supply networks and the industrial systems associated with the production and operation of space capacity. Thus, literature from the fields of sustainable business model innovation, strategic management, supply chain design and capacity utilisation of teaching space was revised, employing a broader economic and strategic management perspective. The research then conducted two quantitative methods to identify the value uncaptured, and quantify the extent of unused capacity.

The findings demonstrate that venturing to employ advanced technologies to capture uncaptured value inherent in unused space capacity reshapes the value chain. Demand changes, and disrupts the industrial system involved with the capacity studied. The supply network transforms to adapt to the disruption.

The investigation shows that increasing capacity utilisation of teaching space can decouple carbon emissions from growing space demand but not unlimited. At some point, maximum capacity levels will be approached and defined benchmarks will be achieved. Economic growth rates will exceed what can be sustainably integrated into existing capacity.

Venturing to bring long-term strategies into action enhances an organisation’s competitive advantage. Innovating operational processes reduces demand for the planet’s limited natural resources. Using capacity more efficiently decarbonises capacity utilisation, reducing toxic emissions that threaten life globally.

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