Tailorizing Taylorism:

**To investigate the principles of Taylorism and how they can
inform the design of a contemporary movement efficient
dwelling.**

By Lauren Gasson

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Abstract

Despite contemporary social living activities changing drastically at the turn of the twenty-first century, residential layouts have not changed. This thesis takes the position that dwellings should be designed to facilitate movement efficiency and be moulded around our daily routine. This study seeks to investigate how the contemporary dwelling can adopt Taylorism's principals from the commercial industry, to facilitate movement efficiency in the home. The research will further look at micro architecture as a contemporary manifestation of Taylorism and use it as an architectural precedent.

From the investigation, this research helped formulate a brief for a contemporary method of designing, in which the architect views the individual's routine as a production process to be refined and optimized. The study preformed ethnographic studies on a three individuals whom wanted their home to be an instrument for their living. One study was chosen to analyze. From the study of the individual's inhabitation, a prototype was designed around the ecology of objects used in their routine. This became a fundamental step in the brief.

Once the prototype is created it was revealed that the architect would have an excellent understanding of how their individual dwelled, and therefore could use the prototype to design an efficient routine. Through the method of interrogating and stripping back the individual's inhabitation, this process helped redefine the architect's role and approach to designing contemporary dwelling. The dwelling created using the brief was entirely customized and facilitates every aspect of the client's contemporary routine

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Dedicated to Mum and Dad,
Thank you for providing me with every opportunity to succeed, and
never doubting my potential.

Chapter One.

1.1 Challenges and Opportunities

The home, a place where we spend most of our lives, should be designed to fit our lifestyle and facilitate optimal living. Many people live in houses that do not fit their lifestyle; rather, the inhabitants are made to fit the lifestyle of the house.¹ This occurs because dwellings waste space and provide few of the attributes their inhabitants require.

This thesis explores the position that our ergonomic activities in the home should influence our residential layouts. Architects should research their clients' internal movements. Internal movements include those such as habitual motions, and random motions. Therefore the architect can design heights of surfaces can enable the home to provide the optimum position to accommodate each movement. By understanding how such movements relate to home design, living spaces which maximise efficiency may be designed and thus peoples' living, or living experiences, enhanced.

¹ McLendon, Sandy. *Prefab Elements: adding custom features to your home*. New York: Harper, 2005.

Johann Wolfgang von Goethe questioned why designing for movement efficiency was not given more attention thus: 'One would think that architecture as a fine art works solely for the eyes. Instead, it should work primarily for the sense of mechanical motion in the human body – something which scant attention is paid.'² Movement-efficiency and optimizing spaces within the home are design concepts that have not been questioned since the aftermath of World War Two. From the late 1950's to 1960 the internal layout of the home was subject to interrogation as architects acknowledged the change in society's residential daily rituals, and therefore sought to redefine the layout.

The challenge of this thesis is to explore how a contemporary residential layout can be made to cater for the inhabitants' movement efficiency. This will involve the architect interrogating and understanding their clients' residential movements so that such movements can be optimized. This is gained by performing observational, and further ethnographic, studies on the clients' current inhabitation.

The benefit from this study is that clients can have homes entirely designed to fit their daily routines. The positioning of every mirror, television and window, and the measurement of every surface is specifically placed to facilitate the client's routine. The organization of objects which makes up the clients' personal ecology of objects is holistically specific so when the client, for instance, is finished in the shower, the towel is located directly in front of them. Instead of getting out of the shower, they can simply push the wall forward to reveal a drying off area with access to their clothes. A Shute for the wet towel is also within this space, leading to the washing machine. Or alternatively the client could pull down a drying rack from above them to hang the towel, and then push it back in the light box in the ceiling for drying. The ecology of objects are sequentially organized so the client's movements are minimized, resulting in movement efficiency.

² Johann Wolfgang von Goethe, "Von Deutscher Baukunst.1772," Quoted in *Bonnemaison, Sarah; Macy, Christine; "Architecture of Motion", Informal Architectures, Space and Contemporary Culture*, Black Dog, London, 2008: 180.

1.2 Research Aim.

This research seeks to formulate a contemporary brief that establishes a new way for architects to approach designing. It does this through investigating how the application of Frederick Winslow Taylor's theories, commonly called Taylorism³, can address the client's needs to make a contemporary residence more movement efficient.

This investigation is further supported by researching micro architecture as a contemporary manifestation of Taylorism. Through this understanding the architect can create a prototype of a customized ecology of objects. The prototype can then be used to generate the design into a customized and movement efficient dwelling.

1.3 Research Context.

1.3.1 Taylorism

Taylorism was a nineteenth century application for determining the movement efficiency of workers in American Industrialization. Through his methods of determining the fastest way to perform tasks, factory managers were able to maximize their workers' outputs. This ideology later became a methodology architects used to apply to residential tasks to determine the residential layout. This will be explained in depth in chapter two.

The thesis examines how Taylor's techniques can inform spatially efficient residential design. More specifically, it adopts Taylor's application of the production line and observational studies to inform design.

1.3.2 Contemporary manifestation of Taylorism

This thesis will devise a twenty-first century efficient mode of inhabitation. Micro architecture will allow for the technologies of the twenty-first century to be housed and integrated into a modern day routine. Micro architecture seeks to find the most efficient way, and

³ Wrege, Charles D., and Ronald G. Greenwood. *Frederick W. Taylor, The Father of Scientific Management*. Chicago, Illinois: Richard D. Irwin, 1991.

provide the most efficient design to accommodate any given task. For this reason we can understand it as a contemporary manifestation of Taylorism.

The concept of designing an optimized home for a client demands a deeper understanding of the client's inhabitation from the architect. Through this research, the conventional role of the architect and mentality of designing will be questioned; why do architects not gather a better understanding of their client's routines in order to design for their needs more specifically? This thesis will show that such understanding would create an optimized home.

1.3.3 Tailorizing Taylorism

In seeking an optimized routine, the relationship between the body and the objects it interacts with in the course of that routine is fundamental to the required prior investigation. The observations gleaned from the ethnographic study will enable the architect to determine the client's routine. Within this routine, the architect will be able to determine the frequency with which the client uses each object in the home, and, further, if there are any objects that are not facilitating movement. The deserving objects – that is, those that play a role in the client's routine – will be questioned for the efficacy of their in-home placement. Through this process, the architect can determine a residential routine ecology for each client.

Movement efficiency is applied in a customized way. The architect determines for each client a customized routine which informs a couture prototype from which the architect can then design the residential dwelling. This application represents an interesting departure from the context of the bureaucratic era in which Taylorism first flourished; for, originally, Taylorism was devised as a production line, meaning that one movement-efficient design could be mass produced. Taylor sought the most efficient way of performing a given task and then enforced it as a technique society should employ. For example, the most efficient technique of using a shovel was determined by the weight of the shovel, shape of the handle, and size of the scoop.⁴ Taylor then designed this shovel enforced all his employees to use it in his specified technique so they did not waste any energy. The departure in thinking this thesis represents is that, here, each client's movements are individually investigated. Therefore,

4 (Wrege and Greenwood 1991)

metaphorically speaking, the architect will effectively study each client's shovel, analyzing its scoop and the fluidity of its movements, to personalise their shovel for daily routine.

1.4 Scope.

This thesis investigates the potential for developing movement-efficient residential architectural designs. The specific research focus interrogates, and then formulates, proposed key strategies to inform architects how best to design to facilitate movement-efficiency within the operations of residential buildings. These strategies involve observing and interviewing each client to understand their inhabitation needs.

The outcome is the design of a small dwelling to facilitate movement-efficiency, thus creating an optimized design. The scope of potential clients is narrowed to single dwelling residents aged 18-35 who live in the inner-city and spend most of their time at work. People in this group typically need a central city home with minimum maintenance; a home of this sort is, essentially, an instrument for their lifestyle.

For the purpose of this research observations and interviews were performed on three individuals, all female, aged 22, 24 and 34. Two of the individuals lived in central Wellington and one in central Auckland. The individuals were videotaped performing their everyday routines across three weeks and following that were interviewed for an hour. The findings from the videotapes were grouped according to fixed, common and random activities, heights, privacy requirements, reaching heights, and the order they are used in. These results were discussed with the client and changed accordingly. To test this research, one of the individuals had their inhabitation findings designed into a prototype of both spaces to facilitate their fixed routine movements and essential dwelling objects. From this prototype other design qualities were added in to make the prototype functional. This included structural framing, services, and any additional building components to create a residential dwelling.

1.4.1 Terminology

Efficiency was first used in the sense of establishing an easier way to perform a task through organizing by Taylor⁵. It is a term introduced to this thesis more coherently in the section on Taylorism. It refers to optimizing movement within spatial design. Designing for ease of the body's movement through a space can only be achieved through designing the objects around the body's movements⁶. In this thesis efficiency will be used as a shorthand term for "movement efficiency."

Taylorism provides the theoretical basis of this thesis. It refers to carefully studying, planning and assigning tasks to assist in the manufacture a product in the most efficient manner possible. It was first adopted by industrial revolutionists in the late nineteenth century. It also became a style of designing layouts for residential homes adopted by many twentieth century architects. This thesis introduces Taylorism holistically, and then focuses on its adoption into the residential sector.

Taylorism is often referred to as Scientific Management⁷. However Scientific Management, when considered as a global term, also adopts Fordism and entails many other specific political and social implications. Furthermore, Scientific Management, as a term, refers to a specific movement in America. Therefore, for clarity in this thesis, Taylorism is the more appropriate term to use throughout.

Optimizing, or **optimize**, is used throughout this thesis in reference to workflow, and in particular, to describe the movement efficiency within a residential dwelling. For example to optimize movement B, would be to analyze its relationship to the body, and design for movement B so that it can occur with ease. Therefore, if the movement is getting milk from the fridge, the design must accommodate for the fridge door to swing the correct way and for the milk to be at

⁵ Nelson, Daniel. *Frederick W. Taylor and the Rise of Scientific Management*. Madison: The University of Wisconsin Press, 1980.

⁶ *Bonnemaison, Sarah; Macy, Christine; Architecture of Motion*, essay found in Kiendl, Anthony. *Informal Architectures, space and contemporary culture* London: Black Dog Publishing, 2008.

⁷ The four underlying principles of scientific management are:
The development of a true science
The scientific selection of the workman
His scientific education and development
Intimate friendly cooperation between management and the men
(Taylor, 1998):15

the right height and within reach of a minimal stretch of the arm. The design must also analyze and take account of the previous and following movements (A and C) to ensure they facilitate movement B with the least energy effort. Doing so ensures that the movements work in unison and are optimized.

Ethnographic studies refer to a particular and observational means of gathering empirical data on people to establish an understanding of their body composition, characteristics, material and spiritual culture. Taylor used this method to study his workers to understand how to best accommodate for their needs. In this thesis ethnographic studies will be performed on individuals to gather information on the way they act in their natural inhabitation. Data collection includes participant observation, questionnaires and interviews. An example of how ethnographic studies, or “home science” studies, have been used in the architectural field can be found from a case in Scandinavia and Sweden post World War Two. The objective was to try to chart house work efficiency through in-home observations. The observer was to enter and leave the home as often as they pleased, drawing the subjects’ movements and concocting flow charts. The observer was not to partake in any activities, despite any temptation to involve oneself in the subject’s lifestyle, furthermore, conversation was not allowed and the observer had to retreat to his/her caravan for personal space.

Rationalization in architecture refers to the logical justification for spaces positioned through scientific rules. For example, viewing architecture as a science in which spaces are calculated.

Max Weber, a German sociologist, was responsible for the reverberations of the modern Western world’s thinking on rationalism.⁸ His work often referred to Taylor’s theories of Scientific Management. He wrote, in the early 20th century, of society continually becoming increasingly dominated by efficiency, predictability and calculations.⁹

Functionalism refers to the design of a building based on the purpose of that building. Frank Lloyd Wright’s work of the mid 1890’s is a good example. His work disregarded the notion of balance, symmetry and axis and focused instead on internal functional flow, designing the layout through establishing the client’s intended motion through the home. Similar to Taylorism, functionalism accommodated the most

⁸ bid, P. 24

⁹ Ibid, P. 25

comfortable traffic patterns for all the rooms.¹⁰

Optimizing the organization of movements within dwellings, as applied residentially through Wright's principles, would go on to be called functionalism. The functionalists based many ideals on Taylorism. Adolf Behne commented on functionalists addressing the clients routine, 'Residents in his building have everything at hand – the architect has the residents in hand – through purpose. The architect creates purpose as much as purpose creates the architect!'¹¹ The functionalist addresses and designs the optimal living for every new client with a different foundation; the result is heterogeneous as opposed to Taylorism, which is homogenous.

Micro Architecture. There is significant confusion surrounding this term. It is an architectural style that refers to small highly specified and functional buildings. The term typically includes the way in which these designs are organized as well as the design techniques used. Micro architecture has become more popular at the turn of the twenty-first century due to the lack of space for inner-city housing. Well-known architect Richard Horden, a protagonist in Micro Architecture, believes it has been around for a long time. He draws inspiration from the small dwellings of Le Corbusier's *Cabanon* at Cap Martin and Norman and Wendy Foster's *Cockpit* in Creak Vean. However he believes the term was officially born in 1993 with the construction of his building for the Derby race.

¹⁰ Behne, Adolf. *The Modern Functional Building*. Translated by Michael Robinson. Santa Monica, CA: The Getty research Institute Publication Programs, 1996.

¹¹ Ibid.: P. 123.

1.5 Research Objectives.

To investigate how the application of Taylors theories could make contemporary residential living more movement efficient

To design a customized and efficient ecology of objects for clients

To discuss the application of customized design vs. demographic design with regards to Taylorism and optimizing the home.

1.6 Methodology.

In the fifth chapter, the method of data collection follows the principles of Taylorism, whereby ethnographic studies are performed on individuals. These studies take the form of videotaping the activities of the individuals. The videotapes are interrogated to establish knowledge of the individual's routine. Every minor action undertaken by the individual within the residence is categorized and ordered. The individual is then interviewed to further discuss what amenities they require.

Working with physical materials at a 1:1 scale was introduced as a way of better understanding the relationship and proximity between the individual's body and the interior objects. This allowed movement efficiency to be designed for. The data was then entered into the computer and a customized prototype of the individual's ecology of objects was formulated.

Once the customized prototype is formulated, this research acknowledges that the architect has the understanding of the individual's inhabitation to best inform the design. Essentially, this section is a comment on the information architects should collect to ensure they are best educated to design for the individual's needs. The customized prototype will then be used to design a single residence for the individual in central Wellington.

1.7 Structure.

This thesis consists of seven chapters. Its overall progression moves from the theoretical context of Taylorism in chapter two, draws contemporary comparisons between Taylorism and micro architecture in chapter three, and then specifically addresses how such a comparison can be used to facilitate contemporary optimized living designs in the later chapters. Naturally, the research is presented flows chronologically, reflecting the contemporary outlook towards future thinking for designing.

Chapter two introduces Taylorism and explains the typologies of movement-efficient design. It describes the dichotomy between the merits of this way of thinking and the inherent challenges of designing for efficiency. The case studies that follow show examples of Taylorism's built outcomes, and critically investigate them. Through them, this thesis gathers an understanding of which direction to take the application of Taylorism. It also includes a short history of movement-efficient designs in the twentieth century. . It then considers how to avoid the same architectural problems and criticism which these styles encountered historically. This chapter also seeks to realize the potential of customizing design to create a personal ecology of objects which forms a prototype.

Chapter three introduces micro architecture as a contemporary manifestation of Taylorism. Through explaining the phenomenon of micro architecture in the architectural profession, chapter three establishes a viewpoint of the importance for contemporary architects to address the relationship of the body to the objects of the home. It then introduces a few examples of micro architecture. These include Richard Horden's *Micro Compact Home* and Gary Chang's *Inner city apartment*. This thesis then explains why they are contemporary examples of designing for movement efficiency and how they redefine the contemporary layout.

Chapter four introduces the synthesis section, describing the process undertaken to derive the data into a generative design. From customized ethnographic studies to computer prototype. The process and the ideas behind the theory will be tested in the synthesis section. A residential dwelling will be viewed as the setting for optimizing workflow. By applying rationalism to our in home routines, we can achieve more efficient lifestyles.

Chapter five discusses and concludes the new design approach. It describes the advantages of employing Taylorism in the home. It addresses the opportunities of architects taking this approach to their design brief.

Chapter Two.

Introducing Space Efficiency

The progressive era in architecture (1890s-1920s) was an era of intense social change. At the beginning of the period, Art Nouveau was the dominant design style, celebrating the sensual, the organic, the emotive and the highly decorative.¹ Rational planning and optimizing workflow were new and exciting concepts to designers. People had begun to understand beauty in designs that served a functional purpose.

This chapter introduces Taylorism as the beginning of optimized movement planning. Taylor's theories were well received as they were similar to other ideals of the time celebrating the beauty in practicality suited to purpose.² This chapter discusses the influence of Taylorism throughout the progressive era, focusing primarily on the notion of designing for the clients' movements, thus creating optimized, movement-efficient designs.

1 In the 1890's modernists looked with disdain upon the formal buildings that lay in their wake. Aesthetically sensibility preferred light, conciseness and clarity in the form of functional structures such as iron bridges and cranes. (Behne 1996). Behne writes, 'It opened people's eyes to the beauty of things suited to their purpose,' further going on to say 'Architectural form was seen as a danger, and fulfillment of purpose was seen almost as a guarantee for creating a good building.'

2 In 1895 Otto Wagner revolutionized the means of architectural design with his comment he wrote in *Baucus unserer Zeit* [the building art of our time]: "Something impractical cannot be beautiful." (Wagner, 1896: cited in Behne, 1996)

2.1 Taylorism & Scientific Management.

Taylorism, specifically, is concerned with a form of management through which order is applied to workers' movements to create efficiency and an optimized workflow. Its ambitions are to analyze and synthesize the subjects' movements with the ultimate goal of maximizing labour productivity. Traditionally, it focuses on the commercial sector; however this thesis looks at examples of where it has been applied residentially as a precursor to considering our movements in the home as a production process in themselves.

Taylorism was specifically was born of Catharine Beecher's theories. Beecher believed that a woman's duties should be better understood and analyzed by residential designers. Aspects of her views were later described as "Shop Management", "Process Management" and finally "Scientific Management" in Taylor's publications in the 1880s and 1890s.

Taylor sought, by way of observing his surrounding colleagues and their varying talents and motivations, to improve labour productivity through the standardization of regulations and rational thinking. Specifically, he refined work planning to a science. By analyzing work, he theorized the advantages of improved staff quality, productivity and using price by planning tasks to create optimum efficiency in the work place. Throughout the early 1900's there was a concern for wasting human energy on inefficient designs. Taylor introduced his book, *The principles of scientific management* with an address from President Roosevelt to the Governors at the White House: "The conservation of our national resources is only preliminary to the larger question of national efficiency."³ Taylor agreed with Roosevelt's referral to "national efficiency" and was interested in why it was unappreciated and unrecognized. He quoted Roosevelt further:

We can see our forests vanishing, our water-powers going to waste, our soil being carried by floods into the sea; and the end of our coal and iron is in sight. But our larger wastes of human effort, which go on everyday through acts of blundering, ill-directed, or inefficientare less visual, less tangible, and are but vaguely unappreciated.⁴

³ Taylor, Frederick Winslow. *The Principles of Scientific Management*. New York: Dover Publications, Inc., 1998: Introduction.

⁴ Ibid

Figure 2.1: Frederick Winslow Taylor
from Midvale
Days, 1886

Taylor aspired to stop wasting human effort. He believed it was important to understand the most efficient way of performing a task. He sought to do this through analyzing empirical methods so he could identify the flaws of the tasks movements. He encouraged the workers at the company to undertake the task as he had specified.

Taylor divides the premise of his beliefs into categories of examination of which he sought to accomplish. Firstly, his intentions were to show through a series of illustrations and experiments, the national loss caused by inefficiency in most daily tasks. Secondly, he sought to convince the reader of his articles, and later his book, that systematic management was the answer to this loss. Lastly, he aspired to show the best way to manage staff was to apply science, to set precedents through laws, rules and principles. He argued that the fundamental principles of scientific management are applicable to many different activities, from the simplest individual acts to the work performed in the industrial sector.⁵

These principles help to affirm the aspects of Taylorism that this thesis focuses on.⁶ Though the thesis will explore Taylorism's outcomes of the Production Line, Levittown and The Frankfurt Kitchen, and their failings, it will primarily focus on the process and Taylor's attitude behind the theory.

Figure 2.2: Shovel advertisement based on Taylor's research

5 Ibid

6 The social changes and revolutions enabled by Taylorism (F. W. Taylor 1998) will not be addressed.

Figure 2.3: Taylor's Machine Shop No.1

Figure 2.4: The art and science of shoveling chart drawn by Taylor indicating the optimum shovel load at 21.5 lbs.

2.2 Ethnographic studies in architecture.

Ethnographic studies observe users in their natural ecology to best determine their usability requirements. The time-in-motion study, as a tool of ethnographic studies, was born out of Taylor's devotion to the early development of management.⁷ Time-in-motion studies are now used by designers and architects to calculate how long it takes to perform a task.

It is important in this thesis to differentiate between the two methods of data gathering. A common mistake by designers using time-in-motion studies occurs when the end user of the task is not the person observed. For example, if an architect was designing a new residential chair and, instead of observing how a residential chair might be used, observed how commercial office workers used their chairs. He ultimately would be calculating the science between the commercial user and the object, which would have entirely different results to how a residential user might use their chair. Therefore end product would not fulfil the requirements of a residential chair. Taylor repeatedly timed and observed his staff, describing his work as time-in-motion studies; it would be fair to say he used these in an ethnographic sense. He only ever assessed the end user, developing sophisticated methods of ensuring his stop watch was not noticed by employees so that he would gather correct data.

⁷ Early signs can be observed in his work at the machine shop in Midvale Steel Company in 1881. Throughout his time at Midvale (1883-1890), (Wrege and Greenwood 1991)p.54/55)

Taylor used time-in-motion studies to gather data on movements to uncover the best method for performing particular tasks. He noticed a number of staff working purposely below their capacity level, therefore used the studies in his industrial approach to informing bureau design with the ultimate goal being to stop this “soldiering” in the work place⁸. It was not till the late 1920’s that time-in-motion studies were used to inform residential design.

Taylor succinctly outlined a number of steps to be followed in his time-and-motion studies:

1. Find a number of workers, preferably in diverse work settings, who are particularly skilful at the work in question.
2. Make a careful study of the elementary movements (as well as the tools and implements) employed by these people in their work.
3. Time each of these elementary steps carefully with the aim of discovering the most efficient way of accomplishing each step.
4. Eliminating inefficient steps, such as “all false movements, slow movements, and useless movements.”
5. Finally, after all unnecessary movements have been eliminated; combine the most efficient movements (and tools) to create the “one best way” of doing a job. ⁹

⁸ Wrege, Charles D., and Ronald G. Greenwood. *Frederick W. Taylor, The Father of Scientific Management*. Chicago, Illinois: Richard D. Irwin, 1991.

⁹ Frederick W. Taylor, *The Principles of Scientific Management* (New York: Harper & Row, 1947), P. 11.

Taylor wrote that workmen have been taught the methods of their job through the unconscious and conscious observation of their peers.¹⁰ The new employee observes the old employee and copies their routine. It is the employers' job to observe their employees and perform ethnographic studies to determine the best method of operation for any one (or a combination) of task/s. If they do not either seek advice for the new employees about a fresh way of performing tasks, or devise a streamlined routine for the workers, then the efficiency of the work will never be improved. Taylor believed "This one best method and best implement can only be discovered or developed through a scientific study and analysis of all the methods and implements in use, together with accurate, minute, motion and time study."¹¹ Taylorism stood for redefining the way employers looked at their staffs' tasks, furthermore rediscovering one refined and efficient way to undertake it.

10 Taylor. *The Principles of Scientific Management*.

11 Ibid.

2.2.1 Applying ethnographic studies to the home

Performing ethnographic studies on home users to understand their inhabitation a form of designing that has not, to the knowledge of this thesis, been employed for contemporary designing. Currently, homes are built either with standard sizing components, such as the prefabrication industry, or have had a physical site footprint, which outlines the limitations for the circumference of the building. Furthermore the computer programs which architects design on, such as Autodesk and ArchiCAD, provide the basic components in standardized shapes and sizes, which unintentionally encourage standardized designs.

Through employing the conventional techniques' of computer designing, architects do not exploit the full individuality of their clients' inhabitation. Adolf Behne illustrated that architects need stop constraining their clients within standardized techniques, "The flow of organic life knows no right angles and no straight lines." He further continued, "Straight lines will always resist the ultimate adaption to functional mobility and fluidity. They allow only a general, approximate adaption, nothing absolute."¹² Behne's approach illustrates a fundamental vein of this research. This thesis does not attempt to adopt any current standardized prerequisites whilst designing the prototype; rather explore the avenue of space on demand. It is for this purpose that the client's optimized movements of the routine will determine the amount of space needed for the prototype footprint, and the sizes of objects within the dwelling. This will create an entirely customized dwelling.

Possible reasons for clients accepting, and not questioning the standard designs that architects design for them is due to social expectations. Part 2.7 will investigate radical designs by architects throughout the twentieth century that question the internal inhabitation is portrayed. However, for all the radical efforts to change the layout of inhabitation, the twenty-first client often wants a house that suits some of their needs but does not question the standardized residential layout that society expects. However, social expectations are changing. This thesis acknowledges that for all the new activities of the twenty-first century, architects should lead clients into a new way of inhabitation. The design of this thesis will attempt to give the individual what they didn't realize they needed.

12 Behne, Adolf. *The Modern Functional Building*. Translated by Michael Robinson. Santa Monica, CA: The Getty research Institute Publication Programs, 1996. Pg 121.

The theory of using ethnographic studies to inform the inhabitant's requirements could be applied directly to the home. The research questions why dwellers perform tasks in their home constrained by both society's expectations, and the spaces that are inefficient for their daily tasks. A residential dwelling should reflect the architect's interpretation of the client's movements.

2.2.1.1 Relationship between the architect and the client

It is important for this thesis to acknowledge that using ethnographic studies to inform the residential design for the client will require a good relationship between the architect and the client. Behne illustrated the desired architect and client relationship ‘The architect can only grasp and carry out his truly artistic work, that is, the creative work, when he addresses questions of his client’s attitude to life, way of living, business methods-something that of course he can only do with him, not without him or against him. For this reason “being a client” is not just buying a piece of land, some bricks, and an architect. The client must be an activity, whose taking possession of the acquired space is so definite, clear, rich, and organic that it can be transformed into the relationship of masonry walls, indeed relationships governed not by convention or mere custom but by necessity and a living sense.”¹³ The architect would not be able to gather a clear understanding of the client’s approach to living if the relationship was not one of trust and respect.

This attitude can be likened to Taylor’s address of the relationship between the employer and employee. In the book, *“The fundamentals of scientific management”*, Taylor describes the paramount relationship between employer and his employee’. He comments that in order for the employer to gain maximum prosperity from his employee ‘he must ensure the relationship is not one of antagonism and further that he has provided all the necessary requirements for the employee’ to perform his job to the best of his abilities. A similar understanding must form between the architect and the client; it is the only way the client will allow the architects to really engage with the small, but fundamental aspects of their lifestyle.

The design of this thesis will incorporate ethnographic studies as a tool for interrogating clients’ routines, before determining how best to optimize their home routine. By studying the clients’ movements, the architect will have the knowledge to design efficient spaces, based around clients’ optimized routines.

13 Ibid: 120.

2.3 The Production Line.

Bureaucracy is organized and rational; and this is what Taylorism became in the commercial sector. Once employers realized the potential of bureaucracy in the workplace, it gave birth to McDonaldization. McDonaldization stands for chain franchises with mass produced systems through methods chosen to achieve a given end, which were the most appropriate and efficient.¹⁴ The efficiency of the work produced by the employees of these franchises is measurable and constant. Employees simply follow rules, regulation and dictates of the structure. There is less room for individual variation in choice. The means of production are guided or even determined by the one best way of performing each task. Should problems occur; standard procedures are in place to deal with them.¹⁵

Both McDonaldization and Taylorism can be criticized for the way they dehumanise employees in the workplace. Taylorism's rational principles turned McDonaldization into a global phenomenon. By turning workers into robots, employers minimise risk of unforeseen mistakes. "Instead of expressing their human abilities to do the job, people are forced to deny their humanity and to act like robots".¹⁶ No initiative is sought from employees. This has resulted in universal mundane jobs, which have no incentive for staff other than wages.

Before discussing case studies that have used the production line, it is important to mention that the production line will be applied to

14 Ritzer, George. *The McDonaldization of Society*. Edited by Benjamin Penner. California: Pine Forge Press, 2008:p. 25

15 Theorists have argued that the first sign of rationalization and bureaucracy as a by-product of Taylorism and resulting in McDonaldization was in the Holocaust. In the form of mass produced death. However the first consumerist precursor was the automobile industry. (Ritzer 2008) Henry Ford was the first to invent the assembly line. An invention based on Taylorism, whereby efficiency of time, money and energy were paramount. "The assembly line went on to have an immense impact on America's industrial sector. It found its way into shop floors, health care, prisons and wartime supply plants. The fast-food restaurant is an evident remnant. All of the processes in fast-food restaurants are preformed in assembly line fashion, broken up into small mundane tasks. The automobile assembly line was not only a precursor; it also laid the groundwork for McDonaldization in another way. Not only did it reside in the processes of operation, it too mass produced cars a low cost, making them affordable to everyone, therefore adding traffic to the roads and creating demand.

16 Ritzer. *The McDonaldization of Society*: P. 32.

the internal activities which occur in the home. This will be done by viewing the individual's routine as a production line preformed every day. This thesis will seek to optimize the routine to create an efficient routine. Through turning the busy, inner city dwellers routine into an efficient production line, it will occur with ease, as the fastest rate possible, and leave more time for leisurely activities.

Therefore the criticism of the production line must be acknowledged. For example, if the architect turns the individual's routine into a production line, it would become mundane and dehumanized. This is possible true, however this thesis understands that through whatever way or form routine is carried out in the home, it will have to be undertaken at some point, and therefore the architect should optimize to ensure it occurs with ease and at the fastest rate possible.

Figure 2.5: William, Abraham, and Alfred Levitt pose in front of an aerial photograph of Levittown, Pennsylvania.

2.3.1 levittown.

Levittown, a suburb built in Long Island America, was the height of the assembly line.¹⁷ The epitome of prefabricated efficiency, it was born of commercial prospects. Many theorists view Levittown as the best built example of the direct results of Taylorism. Levittown is significant in this thesis because it highlights the importance of creating a routine, and optimizing that routine, for maximum efficiency. Essentially that is the process of a production line. It is therefore important to understand the success and failings of the production line.

While the construction industry had been dormant since the beginning of the depression, the Levitt brothers, William and Alfred, revolutionized the production line by applying it to the post war demand for housing. Their father, Abraham Levitt, foresaw the return of soldier's kick-starting the industry. Therefore he went to Long Island, Nassau County and bought 7.3 square miles of land. This would become the first Levittown suburb. Two more followed. The second, located in Bucks County, Pennsylvania and the third was in New Jersey. The thesis refers to the original Levittown location.

As stated in *The Levittown Legacy*, the government took specific measures to cope with the housing emergencies which first opened the door to large-scale suburbs. Levittown could not have happened without them.¹⁸ Prior to World War Two, builders averaged fewer than five houses per year.¹⁹ However, post War a streamlined process of supply and demand created a potentially unlimited market.²⁰ Through rationalizing Taylor's planning procedures, Abraham Levitt and his sons took advantage of this. They utilized their staff and resources to construct 17, 447 homes in 1947-1951.²¹

17 Harris, Dianne. *Second Suburb: Levittown Pennsylvania*. Pittsburgh: University of Pittsburgh Press, 2010.

18 Leopold, Ellen. *The Levittown Legacy*. Monthly Review: www.monthlyreview.org/1100leo.htm, 2000: P. 1

19 Halberstam, David. *The Fifties*. New York: Fawcett Columbine, 1993

20 Leopold. *The Levittown Legacy*: P. 1

21 Ritzer. *The McDonaldization of Society*: P. 33

Figure 2.6: The Cape Cod-style homes that first became available in 1947 — with four rooms and one bathroom — were offered for \$6,990, and 800-square-foot ranch homes went for \$7,990

Figure 2.7: Aerial photograph showing poured concrete slabs.

Figure 2.8: A view of Levittown, N.Y., in 1948, shortly after the mass-produced suburb was completed on Long Island farmland.

William Levitt, explained the system in this way:

“What it amounted to was a reversal of the Detroit assembly line....There, the car moved while the workers stayed at their stations. In the case of our houses, it was the workers who moved, doing the same jobs at different locations. To the best of my knowledge, no one had ever done that before.”²²

Under this system, as many as 36 houses could be built in a day. The first house went on sale in 1948. By 1951, over 75,000 people were accommodated for. The Levitts ensured all the products and services were kept onsite and therefore controlled everything from the site. They preferred to use partial prefabrication, believing it was more efficient than building complete prefabricated houses.

Construction of each home followed a series of 27 defined rationalized steps. There was a team created for each step. This sped up the entire process. The Levitts also ensured payment was increased on the amount of work produced, rather than on the amount of hours spent on site, minimizing soldiering.²³

22 Pace, Eric. “William J. Levitt, 86, Pioneer of Suburbs, Dies.” In <http://www.nytimes.com/1994/01/29/obituaries/william-j-levitt-86-pioneer-of-suburbs-dies.html?scp=2&sq=william+levitt&st=nyt>, by The New York Times, 1. 1994.

23 Soldiering was a term introduced by Frederick Winslow Taylor as a way to describe the workers on low wages, taking the longest amount of time to complete the job. This meant there will be continued work and no cuts in staff. In his research he reveals that in order to get the highest output from the factory, you must pay the workers on a slightly higher than competing companies and on an output basis, rather than time.

2.3.1.1 Critique of Levittown's Production Line

The importance of the example of Levittown is for what it demonstrates of the use of the production line. Therefore the critique of Levittown is specific to the outcomes of building using efficiency of a production line as a main driver.

Much of the critique levelled at Levittown's production line came from the international style that was created of the suburban home. Levittown was at the centre of many debates about aesthetics and the social impacts of housing developments. The homes built in Levittown struggled to avoid the snobbery of those developers who went without government funding, and the residents of privatized developments. Private developers and their tenants sought to individualize their homes in order to distance themselves socially from such developments as Levittown. The term "cookie-cutter" lifestyle and "ticky-tacky" were often used to describe Levittown.²⁴ Many jokes and articles were made about citizens getting lost in Levittown, which was described as a maze in which residents may not be able to find their way home. The result was that many new home owners sought to paint their homes in unusual colours to distinguish them from their

Figure 2.9: Cartoon illustrations by Bill Griffith critique Levittown

Figure 2.10:
Rancher models
for the 1953 Levittown, Pennsylvania, slightly modified from 1950 Ranch models at Levittown, New York.

Figure 2.11:
Families line up to inspect the model homes, December 1951.

Figure 2.12: Some of the many Levittown homes that have been remodelled and expanded beyond their original proportions.

Conclusions

This thesis will firstly test the application of the rational and pre determined production line, as a method of routine to create efficiency within the home. An example of this is The Frankfurt Kitchen which is introduced in the next section. By acknowledging the current routine that clients' already undertake in their day to day lives, it will attempt to optimize this so there is less time spent on mundane day-to-day chores. This creates an internal production line.

Figure 2.13: The Architect: Margarete (Grete) Schütte-Lihotzky (1897–2000) University of Applied Arts, Vienna

2.4 Taylorizing interiors.

2.4.1 The Frankfurt Kitchen

Taylor's concept of designing for movement efficiency trickled through the commercial sector at the beginning of the 20th century when it was adopted by many housing developers who sought to redefine internal layouts. One of Taylorism's advocates was Christine Frederick. Published in the 1910s, her theories were influential in convincing many designers to view household work as a true profession. Frederick's *The New Housekeeping*, argued for rationalizing household activities.

Margarete Schutte-Lihotzky's was a feminist who hated kitchen work and was driven by the desire to make it easier for women. She had read the works of Christine Frederick and was inspired by Taylorism.¹ Schutte-Lihotzky was mainly focused on Taylorism's emphasis on internal movements; she wanted to revolutionize the way women worked in their homes, to make life easier.

The problem of rationalizing the housewife's work is equally important to all classes of the society. Both the middle-class women, who often work without any help [i.e. without servants] in their homes, and also the women of the worker class, who often have to work in other jobs, are overworked to the point that their stress is bound to have serious consequences for public health at large. ²

This quote illustrates the mindset of the 1920's working woman and gives insight into why Taylorism became a popular design strategy.

1 Wilson, Chris. *The genius of design [video recording] : The compelling five part series on designs that shaped our lives*, 2010.

2 Lihotzky, Margerette Schutte. *Rationalisierung im Haushalt Das neue Frankfurt, 5/1926-1927*.p.120-123. Sourced from Kaes, Anton; Jay, Martin; Dimendberg, Edward. *The Weimar Republic Sourcebook*, 1995, University of California Press, London: P.462

The role of the housewife at the time held an important status in society, especially in the Weimar Republic, for example The Housewives Union.³ By rationalizing housework, time spent doing unproductive or inefficient household activities could be better delegated to paid factory work. Having more time further opened doors for women to pursue other interests in fields that were generally only available to men, such as education and learning sports, therefore improving women's current status. Through these ways it could be suggested that Taylorism in the residential sector was showed more social advantages to women than were foreseen.

2.4.2 Interior Production Line

In 1926 Schutte-Lihotzky designed The Frankfurt Kitchen with one priority in mind: to rationalize women's housework. Schutte-Lihotzky's Frankfurt Kitchen used the production line as a routine for home users to create more efficient interior spaces and applied it as a prefabricated mass production technique. It was one of the most prominent fore-runners of modern efficient living. Schutte-Lihotzky intended the design to provide a solution to the social housing shortage. She combined the theories of Taylorism, specifically rationalism, the production line, and ethnographic studies to inspire a revolutionary design of its time.

³ The Guardian, "Radical and Chic," *Guardian.co.uk*, 1 April 2006, www.guardian.co.uk/lifeandstyle/2006/apr/01/homes1 (accessed October 28, 2010).

Figure 2.14: Plan of the Frankfurt Kitchen indicating its labor saving features 1927.

of the Frankfurt Kitchen indicating its labor saving features 1927.

5 Museum of Modern Art, *The Frankfurt Kitchen*.

2.4.4 layout

In the 1920s Taylorism became known all over Europe in the commercial sector. Schutte-Lihotzky took the concepts of these ideas, and studied industrial kitchens and their optimal layouts to form a contemporary ecology of kitchen objects. Schutte-Lihotzky timed how long industrial cooks took to perform tasks in the kitchen and designed the space accordingly. She drew numerous diagrams of the cook's movements within a kitchen; she then positioned all the kitchen appliances and objects for maximum efficiency.

Schutte-Lihotzky's inspiration is evident in the layout and the size of the kitchen. Measuring only 1.9m by 3.4m, a conscious design decision to minimise the number of steps needed when working in the kitchen. The main entrance to the rectangular space was a single door through one of the short walls. On the opposite wall there was a window. From the entrance, the longer left wall had a second sliding door connecting the kitchen to the dining and living rooms. The space contained an electric stove, cabinets, a single sink, workspace and an ironing board. A strong sense of organization was expressed in the no nonsense design. As a result, the Frankfurt Kitchen held no room for personalization. Dedicated space ensured no space was wasted including the labelling of bins such as flour, sugar, rice and so on, to keep the kitchen organized. The spice rack was located beside the stove for flow of reaching movement, and the benches were of sitting height, so standing whilst cooking was optional. Thought had even gone into the colouring of the benches. They were painted blue as research had found that flies avoided blue surfaces.⁶

Furthermore the Frankfurt Kitchen held no room for any lavish furniture or stand alone pieces, but instead pioneered prefabricated kitchens, complete with appliances.⁷ The post war demands for mass housing meant designers were on strict budgets and had to appeal to consumers in a new way. Schutte-Lihotzky's use of the production line as a way of viewing the interior for spatial planning was a successful new appeal. The resulting Frankfurt Kitchen was reproduced in the 1920's to make approximately 10, 000 units.⁸

6 Brignull, Harry. *The Frankfurt kitchen, 90percent of everything*. June 16, 2010. <http://www.90percentofeverything.com/2010/06/page/2/> (accessed August 19, 2010).

7 Museum of Modern Art, *The Frankfurt Kitchen*.

8 Brignull, Harry. *The Frankfurt kitchen*. (accessed August 19, 2010).

Figure 2.15: The Frankfurt Kitchen: view toward the window 1926.

2.4.5 Critics

Schutte-Lihotzky used time-in-motion studies rather than ethnographic studies. As referred to above, the difference is that ethnographic studies apply collectively to studies performed on the intended users, whereas time-in-motion studies can be performed on oneself. Schutte-Lihotzky, deriving her inspiration from Taylorism as applicable in the industrial sector, studied industrial movements. However, the designs were to be used by German working class families, rather than industrial workers. The design failed because the particular details were designed for industrial chefs. Her work was a case of *dog-fooding*,⁹ or not designing for the end user. Critics have suggested that for all the research put into the spatial efficiency of the Frankfurt kitchen, an ethnographic study would have uncovered all of the user problems as it would have studied the German families. Therefore Schutte-Lihotzky would have understood their habitual activities, and designed for efficiency from their movements.

An ethnographic study also would have uncovered problems of customization. For example the food bins were easily reachable to children and pre printed labels were put on drawers.¹⁰ Schutte-Lihotzky did not allow for this or the users opinion. This resulted in any odd food products being put in the wrong drawers. Furthermore, her kitchen did not respect the ideals of family living, allowing room for only one person, making the housewife feel isolated.

It could have been that Schutte-Lihotzky was too focused on her ideals of creating less work for women in the home. Or perhaps the Taylorism movement was very *en vogue* or that there was no time to perform extensive user research. However it provides an excellent lesson for this research, as Schutte-Lihotzky used the methods this research attempts to employ, but without considering the social implications of the design.¹¹

9 *Dogfooding*, or eating your own dog food, is an expression that comes from the idea that companies should eat their own dog food, or use their own products, instead of testing it on the end user. Therefore when the products go on the market for sale there can be a lot of user complications. (Heft 2009) (accessed September 3, 2010).

10 Brignull, Harry. *The Frankfurt kitchen*.

11 Brignull, Harry. "The Frankfurt kitchen."

2.4.6 Repercussions

Just as the 1920's saw international demands to rediscover and rationalize the modern layout of a dwelling after World War One, it took until after World War Two for demands for mass social housing schemes and for the principle of the Frankfurt Kitchen to extend to Britain. Schutte-Lihotzky's ideals were resurrected through the 1950's. However these studies analyzed real women in the kitchen, not commercial chefs. Ethnographic studies, rather than time-in-motion studies, were conducted to determine how modern design could accommodate the post war change.¹² Due to the ethnographic studies creating an appropriate design for the users, the new model was considered a success.

Sweden, Norway and Germany were known for conducting these social experiments. The focus was typically on optimizing the usability of the kitchen. The observer would sit on a high chair overlooking the kitchen and take notes of the users' actions around the home. Generally, for these experiments, time was not introduced as a determinant; it was more a question of relationship of body to object. This relationship was used to test the success of the design.

12 Museum of Modern Art, *"The Frankfurt Kitchen."*

2.4.7 Conclusion

This chapter has discussed both Levittown and The Frankfurt kitchen as products of Taylorism's production line respectively, as an external mass produced built form in the first case, and an internal prefabricated component and a mass produced built form in the second.

The Frankfurt Kitchen provides a fundamental example for this thesis as it presents itself as a direct result of Taylor's theories when applied to the layout of a residence. However much of the criticisms directed at these products were because they were mass produced and applied as a one-size-fits-all approach to solving some of society's most pressing design problems. Yet this failing shows an excellent example of why ethnographic studies are important to perform on end users. Society wants customization. Designing a space that is fit for purpose is only successful if the purpose is interrogated and understood. This way of designing also provides a good tool with which to measure the success of the internal design form. The design must consider the relationship of the body to the object as this determines the success. This will be discussed further in section 2.6.

The research in this thesis will attempt to avoid the mistakes made by Schutte-Linhosky. The theory will not be used to formulate an efficient internal layout designed to apply to society generally; but will show how the theory can be applied to satisfy the needs of clients individually. This thesis will not employ the concept of the production line to mass produce the end design which will then be installed in millions of homes. Rather, it will view each individual client as having their own production line that occurs within the home. This is a way of describing and interrogating the custom movements that are made in the client's routine.

2.5 Tailoring the Production Line.

Introduction

By the mid twentieth century Taylorism became liable for conformity. What was technology merged with efficiency, functionality and aesthetics¹³ became technocratic, visually impoverish, large-scale anonymous products indifferent to people and context alike - an international style.¹⁴ The production line allowed Taylorism to self-destruct through prefabrication, expansion and consumption lead by the commercial sector.

However, prefabrication has, in a rather unintentional way, concealed Taylorism.¹⁵ It proposes a format, a way of *cookie cutter* living, a contemporary 'lifestyle' defined but the selection of components available within the built region. Prefab claims to be, but is yet to be, custom.¹⁶ This thesis is of the opinion that prefabrication can never achieve the architectural couture needed to make a home a tool for living, as everyone's lifestyles are different.

Moreover, prefabrication, as a form of catalogue selection is not utilizing the architect's expertise. It will eventually create a style, and the downfall will be that of no personalization, failure to accept that people's tastes change with the fashion trends; the terminal's of Taylorism.

13 Guillen, Mauro F. *The Taylorized Beauty of the Mechanical*. New Jersey: Princeton University Press, 2006.

14 Ibelings, Hans. *20th century architecture in the Netherlands* / [translation, Michael O'Loughlin]. The Netherlands: Rotterdam : NA, 1995.

15 McLendon, Sandy. *Prefab Elements: adding custom features to your home*. New York: Harper, 2005.

16 McLendon. *Prefab Elements*

2.5.1 Furthering Taylorism

This thesis argues that through prefabrication and using the production line to create cookie cutter components, architecture is not progressing, or keeping up with contemporary inhabitation. Conversely, it is making a larger standardized set of what we already have.¹⁷ It does not benefit the individual to have a large selection of nothing that suits them specifically.

Therefore, this thesis will optimize the individual's routine using the production line; however it will not impose a completely new routine. It will analyze the current individual's routine, or production line, and optimize the ecology of objects that surround it.

17 "One of the most standardized areas of architecture is residential architecture." Hulin explains that citizens are expected to live in what society deems are normal homes. He continues "Typologies and client requirements have been assumed to be the same. Should someone live on the eastern side of town, their residential needs are assumed to be similar to their neighbour. Creating architecture generic nodes of covenants based on the neighbor or developers taste and style." (Hulin 2009)

2.6 Customizing the Ecology of Objects.

It is fundamental to be aware that customization is now introduced into this thesis. The former research has been based intentionally around the prefabrication industry, a product of the assembly line and of Taylor's intentions. The prefabrication industry performs ethnographic studies on a range of clients and mediates the results into one design. However, if we acknowledge that everyone has different lifestyle and a different routine, we cannot force a routine onto society. For example Margarete Schütte Lihotzky applied a new domestic layout on a mass scale to facilitate for the mass housing shortage in 1926. However, her failings were that she did not employ ethnographic studies on actual users. Therefore her designed ecology of objects was wrong for the user. However, if we consider that every family would have a different ecology, every housewife a different routine, Lihotzky could not possibly have been able to know exactly how to optimize a family's routine without having studied the specific intended client.

In the Television Series *The Genius of Design episode 2* Tom Dychhoff talks of Lihotzky's Frankfurt Kitchen: "That idea of imposing a vision on someone and expecting them to live up to it is an absolutely impossible dream for any designer, so I always say this to our clients, you need to create something that's adaptive, you need to build in flexibility and you need to allow the person their right to customise the experience that your creating for them." ¹⁸The design component of this research will investigate a tailor made or a couture solution between architect and industrial designer. The residence will aim to fulfil the clients' requirements and be changed considerably to customize itself to the client's needs.

By applying ethnographic studies to individualize the design to the client's customized routine, each client will have a different routine and a different design. The architect is forced to collect an understanding of each client through the act of performing the ethnographic study. Once the architect gathers this data, he/she can design an optimized residential dwelling.

The success of the design will be measured, much like Lihotzky's work, on minimizing time spent on chores within the routine to allow for maximizing leisure time. This will involve creating efficiency of movement and having objects that facilitate a successful flow of movement within the interior of the space. Form follows optimized routine.

2.6.1 Contradictions of Tailoring Taylorism.

It is only fair, at this point in the thesis, to acknowledge the contradictions of 'tailorizing' Taylorism. Taylorism was always intended for mass production. Taylor sought to educate workers on the most efficient way of performing a task, apply it to hundreds of workers. Furthermore all of the individual tasks that made up the daily system for the workers became the production line that he then applied to other factories. This thesis seeks to customize all the tasks, which results in a customized production, which is entirely tailored to the individual.

2.7 Reaction to rational designing and optimizing to inform design.

Although this thesis primarily focuses on the progression of the early twentieth and twenty-first centuries this section was incorporated into this thesis to illustrate a few of the attempts to redefine the contemporary layout. The examples shown are briefly summed up and links between them are noted.

Designs for an ergonomically designed contemporary layout were not just confined to the kitchen. Post World War One and Two, the dramatic change in social living meant optimizing living was a widely interrogated topic. Society questioned whether a man's home should be a castle, or a machine for living.¹⁹ Similarly it may be asked whether the kitchen a heart of the home, or a factory for food production.

¹⁹ The Bauhaus was an example of trying to educate young designers to design in an industrial fashion (Moller, W. 2010). "The Bauhaus was the centre of new thinking, and the pieces they produced were the furniture of new thinking." (Saville, P. 2010) However "it was not a question of a style, they (Loos and his successors) did not want a style that was counterproductive for him to think about a style. They want to have the vision for a new kind of life; also they want to educate the people to become new human behaviour for the 20th century, for a new future." (Moller, W. 2010). *The genius of design [video recording]*, Directed by Wilson, C. 2010

2.7.1 Chronological timeline of redefining society's residential layouts.

2.7.1.1 Post World War One.

Dymaxion house 1927-28

In 1927, a year after the production of the Frankfurt Kitchen, Buckminster Fuller sought to redefine contemporary spatial movements, with a micro design called the Dymaxion House.²⁰ The house was only designed to weigh 6000 pounds, and be erectable anywhere.²¹ Priced, like automobiles, at 25 cents per pound, Fuller's motto was 'Houses like Fords'. He took advantage of Taylor's principles of rationalism, and the production line. Fuller set the precedent for 'Houses of the future' to come.²²

²⁰ Banham, Reyner. "The Dymaxicrat." *Arts Magazine*, October, 1963: 66-69.

²¹ Hadas A. Steiner, "The architecture of the well-served environment," *Architectural Research Quarterly* 9, no. 2 (2005): 134.

²² Douglas P. Haskell, *Houses like Fords*, 0 February 1934, <http://www.harpers.org/archive/1934/02/0018679> (accessed November 28,

Figure 2.16: Buckminster Fuller

**PROVING THAT THERE IS
ROOM TO SWING A CAT**

Figure 2.17: "Proving that there is room to swing a cat." Illustrations criticising modernist view on minimalism, reduction of space and rational designing. This created much controversy as society sought to understand their roles in the home were being redefined

Henry Dreyfuss

Henry Dreyfuss was a celebrity industrial designer of the 1930's. He designed his work around individuals to ensure that they would work well to the user. He also acted as a guinea pig for his designs by performing interactive studies on his products. He also drew on time-in-motion studies, and created a systematic approach to design, based on the behaviour of typical American male and females. Werner Moller commented, "Henry Dreyfus called them [ergonomics] human factors, you know, the science of the interface between people and things, and it really is a science, there's a lot of actual measuring of things, distances, heights weights, all those sorts of things, but more than that a lot of observational stuff..."²³ His techniques showed his understanding of how objects fit into a domestic interior.

Although architects were enthused by rational living in the early twentieth century, society was not convinced by efficient, determined lifestyle. People desired to live in 'comfy' houses. "For the aspiring British middle class a timeless classic [building], with aristocratic connections, trumped tubular steel with modernist pretensions."²⁴ Society viewed small efficient houses as an attempt by rationalists to tell them how to live their lives. Keith Robertson, a cartoonist in the 1930's, fuelled society's outrage with many contentious cartoon expressions.

2010).

23 Moller, W quoted in (Kirby 2010)

24 Lawson, Dennis; quoted in (Kirby 2010)

ECONOMY OF SPACE

ECONOMY OF SPACE IN THE LOUNGE HALL

Figure 2.18 "Economy of Space"

2.7.1.2 Post World War Two.

Rational planning for efficiency was reborn in the late 1950's after World War Two, when, due to the need for housing, many families lived together. The modernist architects, encouraged by the merging of science with architecture, were careful with space, and embraced the ideas of waste reduction and order, using efficiency techniques such as time-and-motion studies. The modernists were proud to stand for scientific management and think about buildings as machines.²⁵

25 Guillen. *The Taylorized Beauty of the Mechanical*.

Figure 2.19: The House of the Future - living room, 1956

Figure 2.20: The House of the Future - living room, 1956

Figure 2.21 The House of the Future - entrance, 1956

House of the future 1956

The Smithsonian's House of the Future, 1956, followed the precedent set by Fuller's Dymaxion. It too, suggested that construction in the architecture industry could draw upon aspects of the production line.²⁶ The design was commissioned by the *Daily Mail* to project a vision of domestic life twenty-five years in the future. It featured an internal courtyard, and no external features, which allowed the houses to be assembled back to back and run on in rows.²⁷ The cosmetic quality of the streamlined objects theorised transience but did not attempt to move. The structure and infrastructure aesthetic relationship that was seen in the Dymaxion was preserved in the House of the Future.²⁸

Figure 2.22: The House of the Future - model and images, 1956

²⁶ Hadas A. Steiner, *The architecture of the well-served environment*, Architectural Research Quarterly 9, no. 2 (2005): 135.

²⁷ Banham, *A Clip-On Architecture*: 525-65.

²⁸ Hadas A. Steiner, "The architecture of the well-served environment," 137.

Moma, The New Domestic Landscape, 1972

In 1972, the Museum of Modern Art in New York held an international exhibition entitled *Italy: The New Domestic Landscape*. This focused on the radical “Anti-Design” movement of contemporary Italian design. ‘Anti-Design practitioners felt that design should fit in with humanity, not the other way round.’²⁹ The relationship between the user and the dwelling unit was radically re examined, in an attempt to create a lifestyle for future inhabitation.³⁰ Those involved in the Anti-Design wanted to design objects that would fit in with modern lifestyles and be useful, but unobtrusive.

Figure 2.23 Patterns of use of Joe Colombo’s total furnishing unit.

29 Sutherland, M J. *Italy: The new Domestic Landscape*. March 12, 2008. <http://quazen.com/arts/visual-arts/italy-the-new-domestic-landscape/> (accessed September 20, 2010).

30 Ambasz, Emilio. *Italy: The New Domestic Landscape*. Italy: New York Graphic Society Ltd., 1972.

PATTERNS OF USE

POSSIBLE COMBINATIONS

A CUPBOARD B BATH ROOM K KITCHEN L BED AND PRIVACY

Figures 2.24-2.32: a collection of images of Colombo's Total Furnishing Unit

In the exhibition, Joe Colombo

Joe Colombo was essentially an industrial designer who studied art first and then architecture. Colombo sought to create the “habitation of the future”³¹ and this vision is evident in his all-in-one-living systems. His larger work integrated micro-living-worlds. This concept included Box 1 in Visiona, *Habitat of the Future* in 1969, in which he designed a number of mobile elements in a space for residential living.

For the *Italy: A New Domestic Landscape* exhibition he created Total Furnishing Unit (1971)

The unit, a complete living machine, featured inspiring technology innovations and a deep understanding of how furniture and ergonomics could be married. The result was that entirely dynamic elements could be combined to create a multifunctional living space of only 28 square metres.

Colombo acknowledged the space-efficient practices of modernism but critiqued them on their movement efficiency to further develop them into designs that were better suited to a mobile, fluid lifestyle.³² He enjoyed the challenge of ergonomics, and had an excellent understanding of user requirements when applied to material.

Many of these attempts to revolutionize the inhabitation of the future physically resulted in micro architecture forms. The designer’s concepts for technology of the future were often highly personal and generous in spirit. Therefore, the concept of a modern layout became a field where everything is possible. However the ideals were commonly critiqued for taking a new range of proposals one step too far, resulting in forms closer to science fiction, than the reality of housing.³³

31 Design Museum. *Design Museum, Joe Colombo, Product and furniture designer 1930-1971*. 2010. <http://designmuseum.org/design/joe-colombo> (accessed September 18, 2010).

32 Design Museum., *Joe Colombo, Product and furniture designer*.

33 Braunstein, Chloé. “Micro-architectures or Macro Design?” *Architecture d’aujourd’hui*, no.328, June 2000: 92-103.

At the turn of the twenty-first century, societies must once again seek a new domestic landscape. Rational planning and optimizing workflow can be re-established into design, and we can once again understand beauty in design that is fit for the modern day purpose.

Figure 2.33: Pencil drawing of Colombo's Total furnishing Unit

Chapter Three.

Contemporary Manifestations of Optimization

At the turn of the twentieth century, modernity swept society into new ways of seeing and experiencing space: trains, automobiles, wireless telephones and cinemas changed the way people lived their lives. Due to this, architects questioned and redefined the layout for household inhabitation. As this thesis addressed in chapter two, Taylor not only redefined, but revolutionized the theory for optimizing in home movements.

However, the twenty-first century is equally as dramatic as the twentieth. Cellular phones, laptops, pagers, personal computers, the internet, instant chatting, iPods are now commonplace modes of communication, yet they have represented the rapid pace of change, bypassing one after another in quick succession. Society's very understanding of movement, time, and environment is once again being redefined,¹ a development which ought to be reflected in the layout of household inhabitation. This thesis argues that apart from

1 Goethe, Johann Wolfgang von. "Von Deutscher Baukunst. ." *Quoted in Bonnemaison, Sarah; Macy, Christine; Architecture of Motion, Informal Architectures*, 1772: p. 180.

a few playful attempts, since the mid-twentieth century, movement efficiency in residential design has not been employed.

It is important for architects to acknowledge the historical parallel between the dawn of the twentieth and twenty-first centuries, and to understand our sense of self, experience, mobility, space and time.² In doing so, they will be able to design with this knowledge in mind. This chapter will draw parallels between optimizing routines and micro architecture and conclude by pointing out what architects can learn from micro architecture.

Figure 3.1: Images of Atelier Bowwows designs.

2 Ibid.

3.1 Introducing Micro Architecture.

3.1.1 Micro architectures?

In *Micro, Very Small Buildings*, Ruth Slavid writes that micro architecture is something that either serves a single function or does something more complex in an unexpectedly small space. The micro architectures that this thesis investigates are small buildings that are holistically based on function alone.³ Micro architecture has been further described by the term's founder, Richard Horden, as "an instrument for living"⁴ where all the necessary elements of a building are brought down to their minimum size for maximum use and efficiency.⁵

It is fundamental, at this point in the research, to acknowledge that micro architectures are usually designed for mass production. Micro architectures question, and determine the most efficient contemporary routine and mass produce it as a modern dwelling for all individuals of society, much like Schutte-Lihotzky's work. However, it is important nonetheless to understand the precedents for radical optimized routine change as we look to apply them to the twenty-first century.

3 Another avenue of micro-architecture, which must be acknowledged, steams from a more vernacular and natural point of view. This includes the cabin or holiday dwelling, gardeners shed and castaway's shelter uniformly being transformed to in a niche of trans-cultural fantasy (Braunstein 2000). "They are cousins of the tea house, the hermitage and the retreat and share the same ideology of hidden secrete spaces where meditation serves as the spaces purpose." (Braunstein 2000). The fantasy role in micro architecture is not one which this thesis will explore. It focuses more on the pragmatic side of the small designing; the space efficient side.

4 Horden, Richard. *Micro Architecture*. United Kingdom: Thames & Hudson, 2008: 15

5 Ibid.

3.1.2 Contemporary phenomenon.

Since the dawn of the twenty-first century, micro architecture has become a phenomenon, due to the general economic tendency to reduce the size of the domestic unit.⁶ This can be largely attributed to a single factor; small sites due to extreme density in cities.⁷ This has invented micro architecture as the new residential style emerging within dense cities.⁸ Due to this, there has been a shift in the practice of contemporary architects. To confine within the spatial requirements of small sites, architects are working on a macro design scale.⁹ Rather than focusing on architecture components such as walls, floors and drainage singularly, they are able to focus on the integration of these into large design components such as walls that cater for drainage and fold out to provide a floor. "The domestic unit is the rational touchstone between the architect and his or her client,"¹⁰ architects have the opportunity to take advantage of their new role and become interior designers whom interrogate the relationship of each object to the user.

Figure 3.2, 3.3,
3.4: Works of
Tokyo architects
Atelier Bow wow.

Figure 3.5:
Shedworking, XS
architecture vs XL
furniture.

Figure 3.6, 3.9,
3.10: Tread
Machiya by
Atelier Bow wow
1998.

Figure 3.7: Min-
eral House 2009,
Tokyo, by Ya-
suihiro Ymashita.

Figure 3.8: De-
sign Student to
live in a Micro-
house Replica 3.
2010.

Figure 3.11: Per-
manent Camping
2007 by Casey
brown Architects.

6 "...from an economic point of view, the general tendency to reduce to size of the domestic unit is now leading to a consideration of the micro-architecture phenomenon as being a particularly relevant approach and field of action." (Braunstein 2000)

7 Daniell, Thomas. "Fitting In: Small Sites in Urban Japan." *L'Architecture d'Aujourd'hui*, 328, June 2000: 81.

8 Gary Chang, "Strangled Vision: Hong Kong, A Hidden Locality," *l'architecture d'aujourd'hui*, no. 330 (October 2000).

9 Braunstein, "Micro-architectures or Macro Design?": 92-103.

10 "This fundamental internal module... is now a adventure playground, where architecture and design – related and rival disciplines – both aim to physically manifest and mark the vitality of the link between inhabitant and habitation." (Braunstein 2000)

3.1.3 Contemporary role.

Residential micro architectures are important to this thesis as they, like Taylorism, allow for the radical re-organization of fixed space to maximise efficiency.¹¹ Items such as basins, televisions and kitchens are detachable, allowing optimum user configurations to be determined.¹² Due to the flexibility they offer, they provide a tool and encourage a playful mindset that allows the architect to re-representing the housing unit, rather than settling for a standardized layout many homes still adopt.¹³ The opportunity of architect to design from spoon to city is not an opportunity architects have always had:

Since time immemorial, architects have designed spaces whose subsequent internal life and uses lie beyond their control: once built, the initially intended function takes over and generates different forms, all of which address a single problem, being the relationship of the body to the object. Despite their desire to control the future uses of their design, architects have had to stand back or turn away to allow the users – and indirectly, interior designers – to create their own specific architecture within the building, whether in the form of future layouts or changes made to the internal structure itself.¹⁴

11 It is important to address the potential that micro architecture as a mentality redefining the role of objects in the home. "Micro-architectures also enter into and reorganize the fixed space represented by the housing unit." (Braunstein 2000) Furthermore micro architectures allow the architect more freedom in the way he views the designs parameters. "While the architecture itself must work within a legal, technical, and financial and safety framework, micro architecture can, apart from self evident functions, provide a field of experimentation, research, creation and innovation that can even take the form of a manifesto. This is similar to the situation that exists in the furniture sector where the reduced scale and implicit sociological challenges have led to it becoming a laboratory of creation, research and image for both architects and designers." (Braunstein 2000)

12 Braunstein, "Micro-architectures or Macro Design?": 92-103.

13 "blunt tools [in the] industrial era gave us an economy based on standardization, repetition and mass production." (Mitchell 1999) Architecture based on the limited possibilities.

14 Braunstein, "Micro-architectures or Macro Design?": 92-103.

Micro architecture provides a field of experimentation, creation and innovation that architecture cannot due to its legal, technical and financial framework.¹⁵

This thesis seeks to highlight the potential for architects in this new field of designing. Whilst the traditional role of their expertise is changing, they can take advantage of another role which presents itself, involving a slightly different method of teaching, to affiliate them with the field of interior design better. Similarly, architects could employ staff in other fields of design to help with smaller components, such as cutlery design. Currently, however, there is little evidence of architects employing furniture or interior designers and working closely with them.¹⁶ Micro architecture will allow this to become more common.

The gaps that is closing, between architects and interior designers, plays an important role in the prototype that will designed in chapter 4. Through encouraging the architects to undergo ethnographic studies on their clients, and inspiring them in micro designing, they begin to understand the potentials and limits of their new role as designers.

15 Braunstein, "Micro-architectures or Macro Design?": 92-103.

16 "The issue raised here is that given the few and isolated micro-architecture experiments carried out to date, there have obviously and sadly been too few encounters between architects and interior designers and even fewer attempts to find ways to resolve the way in which housing space is used. Given this situation micro architectures could well be a way of matching the industrial world's propensity to address micro-population segments." (Braunstein 2000)

3.2 Why Micro Architecture is a Contemporary Manifestation of Taylorism.

This thesis argues that, in interior designs, a small space can be totally resolved, therefore reducing the amount of space that is wasted. Small designs eschew complexity allowing architects to keep a sense of control.¹⁷ The space can be designed entirely to facilitate the function, while movements are a smaller radius, and are therefore kept to a minimum, much the same as the Frankfurt Kitchen discussed in chapter 2.4.1.

While this chapter is interested in the relationship between contemporary household inhabitation and the architecture that encompasses it. This chapter also seeks to clarify how architects can design for contemporary household inhabitation. Should clients adapt their activities to the building? Or, alternatively, can the building be made to better support and optimize the client's activities? The answer to the former question begins with the work of the motion scientists of the twentieth century and observing the human body.¹⁸ Similarly, this thesis has established that the performance of the body in relation to objects in the home is a form of analyzing a successful movement efficient space. To answer the latter question this chapter looks at where contemporary architecture that optimizes the client's routine has been design incorporated; that is, in the form of micro architecture. The contents of micro architecture encourages introspection, whether in the form of furniture or a prefabricated unit, blurring the boundaries of an item's function and permitting other types of activity.

17 Ruth Slavid, *Micro Very Small Buildings* (London: Laurence King Publishing, 2007): 9.

18 Goethe, Johann Wolfgang von. "Von Deutscher Baukunst. ." *Quoted in Bonnemaison, Sarah; Macy, Christine; Architecture of Motion, Informal Architectures,, 1772: p. 180.*

3.3 Micro Architecture, creating optimized Movement Efficient Inhabitation.

The first example is one of the most recognized micro architectures today, the micro compact home. This example focuses on the interface between object and body, and how a home can be a tool for living. The second example, although not specifically categorized as micro architecture, deals with how the home can enable activities in a small space. Fundamentally, these small spaces demonstrate the effects of designing for optimized movement focusing on ergonomics and designing for the user. They display an understanding of contemporary inhabitation by addressing the routine of the inhabitation within the design. This includes addressing the relationship of the body to object.

It is only fair to acknowledge that whilst this thesis has learnt that it does not want to apply the production line to create a prefabricated module, micro architecture is however, often designed to be produced on a mass production scale. Therefore these examples do not take a customized approach. A customized approach is what the design component of this thesis will undertake in order to test this research.

Figure 3.12-3.18: Micro Compact Home 009, 2005 by Richard Horden and Haack + Hopfner.

3.3.1 Micro Compact Home

Perhaps one of the most recognized experts in the micro architecture field today is Richard Horden. Richard Horden and Haack + Hopfner's designed the *Micro Compact Home* in 2005. It is the result of decades of research into ergonomics and inhabitation within small design.

The micro compact has mastered dynamic space negotiation. It has spaces for sleeping, working, dining, cooking and hygiene that make it suitable for everyday inhabitation. Every space has a multipurpose; a bed folds down from the ceiling and a shower space becomes available when the front door is closed. "I was intrigued by how well designed small scale can be,"¹⁹ Horden noted in an interview in 2007. The micro compact home allows for all the luxuries of a twenty-first century dwelling. The aluminium cube has a sound system, LCD screen, and its own energy system. It could be argued that the key to why the micro compact home works successfully is that it integrates many modern day technologies which allow the small space to be entirely efficient. For example items such as the LCD screen and the energy system are small enough to fit neatly, and unnoticed within the design.

Horden, and approximately 40 of his students, lived in the first design of the micro compact home for three months after its construction. Through this, he managed to master the relationship between the user and the objects; in his book he writes "[the micro compact home allows] the opportunity to fit furniture to architecture in a more integrated and functional use of space".²⁰ He continues further: "The holistic approach is a fundamental part of micro architecture teaching". Horden ensures that his students gain an understanding of how every inch of the design is important in facilitating daily routine.

The design reflects many modernists' influences. It draws inspiration from the complete living units featured in Italy: The new domestic landscape in 1972, and Le Corbusier's fascination with the ocean liner cabin or train compartment as a prototype for efficient modern dwelling, which similarly intrigues Horden by the precision of small space.²¹

¹⁹ Dumiak, Michael. "A London Architect rethinks the house as a small machine for living in." *Architectural Record*, April 2007: 165.

²⁰ Ibid.

²¹ Ibid.

3.3.2 Gary Chang's Apartment

Chinese architect, Gary Chang is a protagonist in achieving movement efficient design within residential spaces. He lives in a 32sqm apartment in Hong Kong, which exploits every centimetre of space, and can be transformed into 24 rooms. 'Chang studied the different distribution possibilities to optimize his space.'²² At any time of the day the house moves for him, changing to provide for his current routine. He has lived in his apartment since he was 14 years old, and has renovated it four times, so had an excellent understanding of his desired routine within the space. Below are some examples of the refurbishments made to the space before he settled on a final design.

The central open-plan studio accommodates the living and sleeping area and the sliding wall units allow for the habitual kinesis of a resident in a small space. As the units are shifted around, the apartment becomes a variety of rooms. Through shifting the walls and folding down chairs and tables, there is a kitchen, library, laundry room, dressing room, a lounge with a hammock, an enclosed dining area. As Mr. Chang put it, "I glide around."²³ The design is all about understanding the flow of movement and maximizing space.

By designing for the user to adapt his surroundings, Chang has mastered the relationship between the body and its objects in this small apartment, "... it is the people who inhabit it, and who engage in activities in it. I do not want to churn out yet another comfortable home."²⁴ A project like this would not be as successful without the precision and understanding of the customized ecology of objects shown in Chang's work.

Figure 3.19-
3.21: Gary Chang:
Life in 32 sqm,
Gary Chang's
apartment.

²² Arch Daily, *Gary Chang: Life in 32sqm*, 13 May 2010, <http://www.archdaily.com/59905/gary-chang-life-in-32-sqm/> (accessed May 13, 2010).

²³ Ibid.

²⁴ Gardiner, Virginia. *24 Rooms Tucked into One*. January 14, 2009. http://www.nytimes.com/2009/01/15/garden/15hongkong.html?pagewanted=2&_r=1&sq=gary%20chang&st=nyt&scp=1 (accessed February 28, 2010): p. 2.

Figure 3.21 & 3.23: Gary Chang: Life in 32 sqm, Gary Changs apartment. A screen has been fixed above the large window to watch movies, and the home appliances, sink and projector are in a cherry wood column behind the sofa. These lights, plus a few items of transformable folding furniture, help turn the living area into a screening room, bedroom or dining area as the need arises.¹

1 Ibid.

Figure 3.24: The Domestic Transformer packs even more punch; at only 32 square meters, architect and resident Gary Chang has managed to concoct 24 different living arrangements (shown above) using movable walls and folding furniture. Chang lived in the house as a child, and has been able to study and modify its interior arrangement over the years, especially as his family members slowly moved out.

Chang, similarly to Horden, admits to using modernist principles for inspiration, especially those discussed in *Italy: The new domestic landscape* (1972). Furthermore he, like Horden, aspires for the innovations of his contemporary domestic design to be mass produced. However, his work would be segregated into sections to prefabricate. His work is intended to become a prototype to be replicated in apartments to help resolve the shortage of housing and space in Hong Kong, which is becoming more and more troubled.²⁵ “People feel trapped,” Mr. Chang said in an interview with The New York Times, “we have to find ways to live together in very small spaces,”²⁶ which is something he, and Horden understand considerably.

25 [in Hong Kong] The population grew by nearly a half-million in just the last 10 years, and between 2003 and 2007, reports of new cases of child, spousal and elder abuse nearly doubled, something social workers attribute in part to new social pressures caused by the city’s ongoing shortage of space.’ (Gardiner 2009)

26 Gardiner, Virginia. *24 Rooms Tucked into One*: p. 2.

Chapter Four.

Introduction

This chapter creates a project brief for optimized living. The project brief offers a comment on the way architects approach design which formulates a prototype which can be used for a new way of designing. By performing ethnographic studies on in-home activities, the architect can understand the client's needs how they integrate with their surroundings on a daily basis, and reduce wasted movement. Essentially, customized design vs. demographic design is questioned.

This thesis has argued that architects need to take a different to the way in which they design. Traditionally architects meet with their clients over a few meetings during the design stage. This thesis proposes that the architect has a more hands on experience. It argues that it is very hard for the client to communicate the way in which they want to dwell and therefore the architect must investigate this before he/she begins designing.

This thesis has further argued the importance of the architect's clear understanding of both the individual's routine as well as their relationship to his/her objects in the home. This chapter will test this theory to design the prototype. The result will be a customized concentrate of the individual's routine and spatial requirements.

4.1 Structure.

Chapter Four organizes itself in three threads.

4.1.1 Part One

The first thread focuses on the client's contemporary routine and inhabitation. These are established through the use of ethnographic studies on individuals, questioning and observing the ecology of objects within their residences, and examining the role which the body plays in the home. The order of actions within the client's routine was not changed. The form simply followed routine. It was important to gather a good understanding of how the client currently dwelled, before attempting to optimize the routine. Close attention was paid to specific actions; such as how long it took the client to do a mundane activity like dry their hair. The activities were grouped so they could be observed to understand if the simple placement of objects could speed the routine up.

4.1.2 Part Two

In the second stage of the design, *Generating the Data into Design*, the architect optimizes the client's routine. This thesis is of the opinion that only after performing the ethnographic studies on the client, will the architect execute the desired optimization successfully. Through these studies, the architect will have gained enough understanding of the individual's routine that they now have the knowledge to intervene and offer their expertise.

Rather than viewing the body within ecology of household objects, moving from space to space, performing its routine, the architect is to view the body as part of the ecology, to work in harmony with the objects, so each object provided compliments the routine. In an attempt to provide an optimized routine, routine follows optimized form. However, although routine fundamentally follows optimized form, the objects are not the only mechanism. It is the relationship of the body to these objects that provides the determinant and the common denominator all in one. This creates the concentrated prototype.

4.1.3 Part Three

From this model a client can understand their highly customized living routine and all their living requirements. To make up the third component of this thesis the architect can then take into account the other elements, such as structural qualities and services, to make the architecture a successful inhabitation. Furthermore they will give the tight prototype comfortable requirements such as light, space, thermal requirements, and services.

inner city living participant

aged 24

female

no disabilities

no external special space requirements

suggested requirements (see documentation)

4.2 Part 1.

4.2.1 Formulation of Taylorism.

The potential clients:

- are single occupants aged 18-35
- are city dwellers
- live busy lifestyles
- have a general knowledge of present day technology.

The research execution began with observing a number of different subjects, each of whom fitted the above criteria but who had different dwelling situations. The intention was to customize, for each one, a residential dwelling. However, after the ethnographic studies commenced it was realized that to conduct each study in such detail would have stretched the time constraints of the project beyond capacity. Hence, ethnographic studies were only conducted for three individuals. However, only one had their study analyzed and designed for. For clarity this subject will be referred to as individual 3.

As this thesis is designing a brief, it will address the notion of three 'individuals' collectively when describing the data obtained in the ethnographic section. It then will address individual 3 as the client whose information was analyzed in the design section.

It is important to note that the studies were performed all on females. This was unintentional; however it may have some affect on the outcome of the results.

4.2.1.1 Process of Ethnographic studies:

The individuals were videotaped during morning, evening, and weekend activities over three weeks. There were six cameras used which were staged out of direct line of the individual's sight. This generally involved positioning them high in the corner of the room. The cameras were located, in the lounge, bedroom (facing the desk), bathroom (facing the sink), hallway, and two in the kitchen. The majority of the cameras faced in a northwards (facing) section through the house. This allowed for a clearer interpretation of the data gathered.

The morning and evening filming occurred on a Monday, Wednesday and Friday, approximately between the hours of 7 and 8.30am and 5.30 and 10pm. The subjects did not use their residences over the lunch period.

The weekend filming was taken on both Saturday and Sunday. This generally consisted of recording in-house activities between 9 and 10am, and 3.30 and 11pm on Saturday, and between 10.30 and 12.30pm, and 4 and 9pm on Sunday.

Once the filming was concluded an interview was conducted which lasted about an hour (see appendix for interview). The interview was divided into five sections which focused on different aspects of the individual's living habits, from their current living routine and possessions, to future living aspirations and incorporating technologies in the home.

The interview questions were formulated using data from the videotaping to interrogate the individuals about current living conditions, and find out why and how they chose to manoeuvre between certain activities. In addition, a future living section was designed and included to gauge how the design could accommodate for future changes.

The results of the ethnographic study were analyzed for information that could generate and inform the design. As discussed earlier in the previous chapter, this thesis seeks to create a brief, one of which the architect designs individuals' routines as primary generator, addressing all their movements. This chapter will undertake series of analyses on the information gained from ethnographic studies to investigate the individuals' ergonomic dwelling patterns and hence find the best design solutions.

4.2.1.2 Hypothesis:

The results of the ethnographic studies made on individuals, although conducted on subjects whose attributes were broadly similar,¹ varied widely. This is due to the inhabitation information studied, which is personal and customized to each individual.

This thesis acknowledges that movement efficiency around the home is subject to external factors, such as the weather patterns. However, these are uncontrollable variables. This thesis focuses instead on the fixed movements and given data, without considering the external elements. The weather will be acknowledged in section three, when the architect regains his right to design. However, in this section it is important that the architect can focus primarily on gathering data first.

It is expected that individuals may be hesitant to live in small dwellings. Many of the questions from the interview are focused around this notion alone. Society generally views wealth from the size and spaciousness of a home, rather than by the functionality.

4.2.1.3 Observations

From video: The individuals' responded to the videotaping naturally. There were a few occasions when the camera was in direct line of their view (for example, if they looked up) and so their actions changed. This was noticeable as the individuals instantly stiffened their movements. These discrepancies were accounted for in the analysis.

Peculiar activities are certainly an important driver of this project and help to understand the individuals' customized routines. Therefore the observer must be very careful not to be prude and to ensure the camera was out of sight so that the participants felt comfortable.

¹ Clients aimed at a certain age bracket at a busy point in their lives and who do not spend much time at home

One initial concern had to do with the times for the videotaping. The individuals were selected on the premise that they had a busy lifestyle and did not spend a lot of time in their homes. The times of the morning and evening activities during the weekdays were evidently fairly consistent, due to worklife routine. It was the weekend activities that held some concern. There were no set routines for the participants' weekend lifestyles. However, once the studies were underway it was recognized that, whilst only studied over 3 weekends, the individuals were only present in the house for regular times, which kept complications to a minimum.

From interview: The data from the interview gave an insight to what individuals wanted from his/her new dwelling. Each of the 28 questions, although quite similar, provided varying answers. It was interesting how excited and involved the individuals' increasingly became throughout the duration of the interviews. Many clients' were quick to answer but upon reflection changed their answers. This generally occurred during the questions about consumerism and the idea of micro living. Many individuals were originally adamant that they needed all the items that were in their home, however as the interview continued quickly conceited to the idea of minimal living.

The results were also interesting in the environment and technological sections. Almost all clients' said they would be interested in decreasing their carbon footprint, however only if it made their life easier. They denounced that if a reduction in their carbon footprint resulted in a chore, they would not do it. All of them had a similar opinion about technology. If it could operate to help their living and help reduce their carbon footprint then they are interested. However, if it would eventually provide more complications, then they were not.

4.2.1.4 Analysis

The individual's answers to the questions reflect the general hesitation towards micro living that society holds, as discussed in the hypothesis (4.2.1.2). The enthusiasm towards the concept grew considerably as each interview evolved. All three interview participants contacted the reviewer at a later date to add opinions and discuss further, which is considerable as none of the individuals involved were currently interested in building a new house. This indicates the idea of micro living might take a little while for society to grasp, but once the idea resonates; there is enthusiasm for the concept.

It was the video recording that provided the most information. Small actions such as the wipe of hands on a towel could not be accounted for when describing everyday movements in the interview. The video allowed spaces to be analyzed for the desired reach and to ultimately be designed for the ergonomic flow of the body within routine.

The importance of the difference between ergonomic data and bodily movement became apparent when watching the video. It must be noted that as soon as this data began being analysed this thesis realized it must distinguish itself from sources such as Metric Standards or Neuferts Architects Data² and concern itself more with bodily movement as a constant motion. This is because this thesis looks at the efficiency of movement *through* the space. Although static diagrams will be used to analyse the data, they will be drawn at very short instances, so that they capture the transition of the movement during the task. Metric standards generally focus on the movement itself, not the act, such as how much distance one needs whilst sitting at a table. Rather than how much distance one needs, whilst they are bending to hold onto the top of the seat to move into sitting position. This thesis, conceiving to encourage inhabitation which makes living easier, further investigates that once that individual is sitting, which amenities need to be within reach and what will be their next move.

² Neuferts Architects is a book commonly used by architects. It provides a mass of data on spatial requirements and also covers planning criteria and considerations of function and sitting.

4.2.2 Generating the data into design

4.2.2.1 Understanding the movements

Fragmentations of every action were drawn from the video tapes. These were taken from one direction facing in a northwards section through the house. They were drawn at every major action. When aligned, they allowed for a good understanding of how the single occupant manoeuvred around their dwelling. This understanding included the heights of their daily activities and how far the client had to reach/lean/squat/ bend/turn/push or pull to perform their daily routine.

Figure 4.1: Drawings from video of morning routine.

4.2.2.2 Tracking

Interpretations such as how many times one would turn around in a single room were significant. The pure problematic location of objects, furniture and rooms to the client gave new zest to the research. For example, in one morning a client turned 180degrees 37 times! The position of household objects was duly noted.

The analysis from the video included tracking how many steps it took for the client to move between activities. The collaboration of this data made the order of amenities that would later inform the design, and surprisingly changed little from day to day within the activities.

Figure 4.2: Individuals Movements around the existing house

Figure 4.3: Individuals Movements around bathroom of the existing house.

Figure 4.4: Individuals Movements around the bedroom of the existing house.

Figure 4.5: Individuals Movements around the kitchen of the existing house.

Figure 4.6: Individuals Movements around the ensuite of the existing house.

By looking at the numbered diagram of the whole house, one can see the transitional space involved in individual 3's current 57.4m² home, which arguably exists only due to standard sizing and social predetermined expectations of how a residential dwelling should be laid out. The physiological expectation of threshold between rooms and any other subjective advantages are not important to this research. What is, however, are the disadvantages of a larger residence. These being the inefficiency of routine, extra time required to manoeuvre, inefficiency of movement, and the excess resources needed. Furthermore, the disadvantage of the missed opportunity for the client to customize their space and privacy.

4.2.2.3 Grouping - Identifying and Eliminating Inefficiencies.

The first step of grouping was to determine if the movements were fixed, common or random. These were later discussed with the individual to ensure they agreed on the order on the order of the observations for accuracy.

The order of routine gathered tried to eliminate any random movements as they would create inaccuracies in the prototype. The prototype gave priority to the fixed movements. Some common movements were accounted for; however the random actions were not considered in the design of the prototype. Luxury and relaxing activities were, however, eventually designed for. This occurred once the concentrated routine prototype is determined. The architect will use the prototype as a generator.

Drawing the movements in order to understand them, and tracking the routine, allowed the movements to be grouped into heights, proximity of activity to the body and if they needed privacy or not.

A comprehensive understanding of the morning activities took priority over the evening activities, as Individual Three had said in the interview that the morning was their busiest time of the day, and it was when most of the *given* routine occurred. Therefore it provided a basis for the fixed positions for the ecology of objects.

Figure 4.7: Grouping of individuals movements. Note, optimized movements are in the last four grey columns.

	Client
	Age
	Current Address
	Phone number
	Disabilities/ Medical problems
	Special Space requirements

Suggestions/requirements gained from interview:

lighten the right place to light the way to the bed at
handing by kitchen
cell phone charger by kitchen and by handing
to eat do the kitchen
phone not upwards
phone by kitchen
comparing to shift
Random activity (r)

Bedroom for laptop or computer by shift to the way to pack away
charge the laptop by the way to the way to pack away if need and
handy phone for shift and phone not upwards can be by kitchen and by
the way
no more open bed room
no more open office
no more do over handing height to possible kitchen

- L = Low
- M = Medium
- H = High
- Fixed Activity (f)
- Common activity (c)
- Random activity (r)

Activity					Random activity (s)			optimized routine		additional		clients comments	
					if not all activities, list of usual common work					movements		/suggestions	
Bedroom
1	sit up in bed	f	yes	rm	1800 x 2000	bed	(normal)					
	1	put two pillows behind body	f	yes	rm			put two new pillows behind body					pillows to added behind bed
	1	reach over wall turn off alarm clock	f		rm		alarm do the power point	reach into wall turn off alarm clock					
	1	reach over wall check cell phone	f		rm		cell phone charger	reach into wall check cell phone
1	put do the cell phone	f		rm			no movement, deleted					
	1	grab top from desk	c		rm		top top plug power point	reach into wall turn on screen					
	1	pull out cord/line	c		rm			no movement, deleted					plugged in at all times
	1	put back on desk	c		rm	200 x 600	desk/desk	no movement, deleted
1	sit up in bed	f		rm			(normal)					
	1	stretch	f		h			(normal)					
	1	walk to closet	f		h	1800 x 600	closet	no movement, deleted					No need for clothes
	1	grab something from	f		h		clothes	no movement, deleted					as shower is so close
1	put on	f	yes	h			no movement, deleted					
	1	put on shirt/tee	f		h		shirt	no movement, deleted					(new connection to them was toilet) sit next up
	1	grab towel for hair	c		h		towel	(normal)					towel by bed
	1	walk to shower	f		h		shower	(normal)					door
Shower
1	open door, walk into shower	f	yes	h			walk into the room					
	1	put towel on back of door	f		h			no movement, deleted					
	1	kick off shoes and clothes	f	yes	l			no movement, deleted					
	2	take off showering gown	f	yes	rm			no movement, deleted					
Wet room													

4.3 Part 2.

4.3.1 Architects intervention - Optimized Designing.

The second stage of the design will attempt to advance the routine. It will not change the order of the individual's routine, however will identify and eliminate the inefficient actions. It was important to identify any additional activities added, which ensure the new efficient routine works, and the time minimised in relation to the original videotaping, and the time added due to the new movements. For example the client may not need to walk very far from the bedroom to the kitchen, thus saving 24 seconds. However they may need to turn around and fold their bed back into the wall, thus adding 42 seconds.

This design will further facilitate multitasking. Using knowledge, technology and an excellent understanding of the client's routine, the architect intervenes, in an attempt to design to home as a tool for living. *Optimized form movements are added to the spreadsheet entitled in the last two columns*

It is also important to address that internal objects are not the only determinants of routine, exterior elements also have input. Therefore these need to be designed for as adequate as possible to ensure they provide a fair comparison. For example, if the individual currently has a lot of natural light in their bedroom, the architect must design by being mindful of this, not disregarding the possibilities that if the new dwelling does not have similar lighting qualities in the bedroom, the client may sleep for a longer period of time.

Figure 4.8-4.13:
Determining the
ecology of objects
and rationaliz-
ing the space by
designing at 1:1 to
better understand
the space

4.3.1.1 Designing 1:1

This thesis asks for architects to take a more comprehensive design approach to designing for movement efficiency. The importance of designing at one to one became apparent when researching other designers who sought to redefine the internal layout. This allows for a more integrated knowledge of how an object performs in relation to the body.³ Organising the ecology of objects at 1:1 allowed the designer to have freedom because there was no instrumental constraints.

3 Kolko, Jon. *Jon Kolko Interaction Design & Design Synthesis*. Information Architecture and design Strategy: The Importance of Synthesis during the Process of Design. <http://www.jonkolko.com/writingInfoArchDesignStrategy.php> (accessed December 2, 2007).

To design at 1:1, dimensions from the client were taken, so the positioning and size of objects could be customised to their exact needs. As discussed in chapter 3, there was no desire to adopt the attitude of the space being a shell which is filled with an array of objects. Rather view the interior as a machine, working in unison with its objects. All the objects must function together to create efficient living for the dweller. Once individual three's dimensions were known, working on 1:1 scale allowed for this ecology to be thoroughly designed. For example, the radius of their reach was known so objects could be placed accordingly.

The order of fixed optimized movements defined from the video was one of the primary generators when determining objects positioning on the 1:1 boards. The focus being a optimized ergonomic design.

4.3.1.2 2D-3D

The application of the instrumental computer communication demanded further resolution from the design. It became apparent that whilst the 1:1 scale drawings provided an excellent in-depth drawing tool, they were essentially 2D drawing on a 3D board. When put into a computer programme, which is essentially 3D drawing on a 2D screen, the design was becoming both critical and supportive of itself. It was critical because it demanded further understanding of proximity and supportive as through this, it continued to demand a comprehensive understanding of objects from the architect. The question became; how to give 3D depth within movement in relation to the body?

4.3.1.3 Design approach

The design approach was mixed with an array of the observer's (architects) personal subconscious knowledge of in-depth understanding of how the client moved from all the interrogation studies. Further juxtaposed with the subconscious knowledge of where things are normally placed in a building. This was something the architect must intentionally let go. The architect must fundamentally block out the subconscious knowledge of what objects and spaces must look like and how they work together. Thereby not projecting the known assumptions of objects, onto the design. This includes materiality, size and shape. For example, the architect must not subconsciously leave a space by the bed for a bedside table, because even though Individual Three has a bedside table in their current home, and may think she needs one, she might not use it other than for storage of books.

In the computer programme, colours and numbers were used for the block extractions representing objects, rather than names of elements, which might have alluded to subconscious memory ordering them in a traditional sense. The extractions were positioned according to groupings and the routine spreadsheet. The architect designed for the minimum space requirement of the described objects from the data of routine, outwards.

Some appliances have given that are unavoidable, however all surfaces need to be questioned for signs of adaptability and flexibility. For example, to give a washing machine the same surface aesthetics at the seat and the tables, it can be used for seats and tables.

Figure 4.14, 4.15:
Using the instru-
mental techniques
of the computer to
mould the design
around the body

objects used frequently
(fixed objects)

objects used commonly
(common objects)

Figure 4.16, 4.17: Grouping the objects into objects used frequently and objects used comonly to understand their priority when designing. This is done to gather customized ecology of objects for the individual.

4.3.1.4 Design Result

The design did not just focusing on routine, but fundamentally, the flow of movement after movement in order to optimize the fixed routine. Therefore, the design resulted in an almost uncanny layout. The trace of the movement through the designed space made the objects aesthetics look obvious and yet unusual. For example, to open the fridge, grab the milk, and find pears for the cereal behind it. The result is an organic trace of function throughout the residential space.

A good supportive description of this state of design is written by Adolf Berne writes in his *The Modern Functional Buildings, Chapter 3: No longer a shaped space but a designed reality*;

“Strict suitability to functions-what could the building gain by that? When parts of a building are arranged according to a sense of their use, when aesthetic space becomes living space-and this is the kind of order we call dynamic-the building throws off the fetters of the old, fossilized, static order, axes, symmetry, etc., and achieves a new starting point. A cramped, material, stable equilibrium (symmetry) gives way to a new, bolder equilibrium, delicately balanced in broad tensions (polarity) that correspond better to our essence, and with this comes a form that is entirely new and alive, free from constraints and stabilization. And then, through this suitability to function, a building achieves a much broader and better inner unity: it becomes more organic by abandoning the old conventions and formalisms of representation, which inhibit the materialization of necessary form.”

The ethnographic studies performed on Individual Three, resulted in the computer prototype that tailored Individual Three’s ecology of objects. The prototype is entirely customized to each space that Individual Three needed to perform her optimized daily routine. The prototype serves as an example of a concentrate, which, if built, it would be uncomfortably small, and hardly desirable to live in. It still needs the architects expertise to create a beautiful design.

Figure 4.18. Exploded isometric of designed prototype, which is the fixed ecology of objects.

4.3.2 Reflection of the Prototype.

Through suggesting the approach of architects designing for movement efficiency to the individuals, it was noted that all three individuals were interested and excited about it. However before they expressed interest, these clients had indicated they were willing to allow ethnographic studies to be performed on them. Therefore it is important to understand that this enthusiasm may not occur in all circumstances. Many clients wouldn't be happy about their current lifestyle being under interrogation. This is unfortunate as it was through the videos that most of the clients innate movements were understood.

Whilst the results provided successful analysis of the clients movements, performing ethnographic studies can be very time consuming and invading to the client. It is fair to say that not all clients would give the architect permission to videotape them performing household activities.

The individuals involved helped to prompt this investigation. It highlighted how little architects question the standard routine in the home, through how interested the individuals were in pursuing different designs once they were interviewed. They were more than willing to be involved and provide encouraging information on the arrangement of their desired ecology of objects.

original movement

Figure 4.19: Original movements beside movements made in the optimized routine of the prototype.

The cross examine of the individuals routine by tracking and grouping movements showed the original residential dwelling layout created movement inefficiencies. A trap of wasted human energy. The prototype shared no similarities to the original dwelling. This highlights how little the current dwellings accommodate for their residents routine, and how advantageous the option of customizing the home can allow the designer to be, furthermore specific.

Movement efficiency was saved in the home, the client had everything at hand and it was all tailored to their needs. The ordinal home was 57.4sqm, the prototype was 11.4sqm. Even with acknowledging that the prototype needs to be adjusted out by the architect slightly, there is still going to be a saving of at least 75% of space and materials in a home, by solely making the home more customized and more efficient for the user.

optimized routine

Figure 4.20: Portion of Exploded Isometric of prototype.

4.4 Part 3. Application of the prototype.

This section will apply the prototype established from the ethnographic studies. This thesis has explained earlier of the criticism that comes with the concept of international style. The design does not seek to apply, or propose any one chosen palette of aesthetics. Once the individual's prototype has been determined the architect is to use it as s/he wishes to inform the residential design. It is assumed by now, after the ethnographic research and an excellent understanding of the application of movement efficiency, the architect will be fit to make the best choice. Therefore, the following information will act as an example only to test this theory.

4.4.1 Site-less

The site was irrelevant to the outcome of the project and serves as an example rather than an absolute option.

The proposed site is between buildings no. 27 and 29 Brandon Street in central Wellington. The only site requirement of the brief is the intention for interstitial inner city space. Brandon Street provided a good example site as it is a narrow void between two high rise buildings which currently functions as a service lane. It is important to consider the design is made for short lifespan; this may affect the neighbouring buildings.

The design of the building does not have a temporal relationship with the area in which it finds itself, it imposes its own time frame and by doing so, gives the individual the right to develop his or her use cycle without being dependent on decisions made for the urban masses.

4.4.2 Interior Design Choices.

The ecology of objects devised in the prototype forms the bones of the design. The architect needs to further develop the design to create a successful dwelling. There were aspects of the residence that were highly important to the customized design to make it functional, such as the space accommodating many of kitchen and bathroom objects. These aspects were resolved first.

Some areas were less important to the customised design. An example of this was the entry and exit points. Due to the compact nature of the design their placement did not significantly alter the routine.

-The total foot print was 11.4m²

-The overall dimensions of this particular individual's dwelling was 4m long x 3 metres wide x 6 metres high

4.4.2.1 Additional space added.

Added multi use zone: The multi use zone was added into the prototype to allow for random activities. This mainly consists of the multi level zone shown in the images. Playful aesthetic of this space encourages random activities. However, it was important to make this flexible, so it could accommodate a wide range of activities. Therefore, part of the floor pulls out from underneath the second highest step to extend into a larger flat surface. This is shown in the images.

Figure 4.21: Plan of design showing neighboring buildings and location map in the top left corner.

section sequence 4

sequence section 5

sequence section 2

brandon street

plan

service lane

Figure 4.22-4.25:
Sequence showing how occupant moves through space during their morning activities.

Figure 4.26-4.29: Exploded renders showing how occupant moves through space during their morning activities.

4.4.2.2 Internal materiality.

The interior design intentionally used one material to give a holistic aesthetic intended to encourage multi use of surfaces. This was timber painted white or in areas, glass was used. However behind this material, when a object was pulled out, was timber. This emphasised that everything had a place in the home, as it was noticable when things were not put back. All of the cutlery was made to fit into itself serve te routine accordingly.

Emphasis was placed on utility of objects by extruding and lighting them, either natural or artificial, from behind. They gave a disengaged feel from their structure, which remained behind, either made from glass or timber painted white.

All of the surfaces of the prototype only allowed for the notion of movement. For example, the surface above the bed only allowed enough room for Individual Three to move in their sleep. At one end it went higher so she could sit on her bed, or lie in it and watch a movie on her screen, which was already installed, and within reaching distance. In areas where the architect desired, these can be moved out slightly to allow for slightly more comfort, without inconvenience. The above surface beside her bed only allowed for 1.9m. This was her standing height plus 20cm. However beside this space the surface opened up to 2.6m. This facilitated her morning stretch.

Elements of the exterior aesthetics were evident in the interior, such as the perforated panels, these bathed the space with penetrated light. The broken panels gave the space a larger feel.

It is evident in the final product that every surfaces and object serve a function. However the inquisition of the space and monotone materials invite thought of a second or third use. The uncanny aesthetic left a trace of customized movement through the space. Every object was entirely tailored to client three from the size and curvature of the spoon handle to the shape of the bed. The result of the interior design was a gallery like feel. This was further enhanced by the high ceiling and large washes of light.

The visual organization was an important aspect to remember. Although the objects had their predetermined placements from the prototype, it was important to ensure the space was visually balanced. This was helped by the white aesthetic, for example, the prototype had the toilet positioned in the middle of the clients building, however the architect encompassed it in a box like form with the same white aesthetics as the rest of the dwelling. Therefore it went unnoticed and furthermore could be used as a rest for the occupant to shave their legs on in the shower, or in a flexible reconstruction of the bathroom wall, was walked over by the client to get from the bed/dressing area to the main sink.

Figure 4.30: Interior view of multi purpose space.

4.4.3 Exterior Design Choices

4.4.3.1 Structural decisions

This structural design for Individual Three proposes two services and structural options.

The first is a self sufficient option which is structurally cantilevered over the service lane. Client Three's services enter the building through pipes which run between the columns. The elevator also runs in between these columns and upon ascend lifts the entrance to propel the inhabitant directly into the multi use space.

The second structure option involves the bolting the dwelling directly into the neighbouring building. The elevator still enters the building in the same position but is fixed to the neighbouring wall for support. The services for the dwelling are hooked into the neighbouring building in a *parasitic architecture* quality. The services are taken directly through the wall of the host building and connected to the main service core through the suspended ceiling. This is shown in the detailing and images below.

Figure 4.31: Exterior view from Brandon Street of option one.

transverse section

4.32 Section through building showing lift detail. (far right).

Detail of I beam bolting into neighboring wall for structural option two.(top left)

Detail of floor of lift sitting flush in multi purpose space (this moves down upon descend. (left bottom)

4.4.3.2 Exterior Facade

The exterior facade of this building does not serve to accommodate the routine in anyway. Therefore this was not a priority when designing. It does, however, give the public some idea of the internal design. It is made from multiple panels to break it up and attempt to look larger. The glass visually encompasses the whole building is broken to allow white panels to protrude through where an object from the customized prototype is placed. Internal elements, added after the prototype are shown by the perforated panels.

Figure 4.33: Exterior render from Brandon Street.

Opp. Figure 4.34: Photograph of physical model

4.4.4 Reflection of the final Design.

The unrealised potential of designing to specific needs of the site was not understood until this work was complete. The unusual shape that resulted from the individual's routine created an angular void which allowed light through. This provided a nice visual break in the form when viewed from below. The broken level of the floors also allowed for extra space underneath. It was acknowledged that if the building was at ground level, this space could function as an alleyway which still allows people to bypass the dwelling in the tight space. However, it is important to remember that these final form and size qualities are subjective to the individual. Therefore, if a different individual's routine was used to determine the prototype, and a different architect designed the prototype into a dwelling, the outcome would be entirely different.

The final design proved to contradict itself considerably. In chapter 2.6.1 it was discussed that tailoring or customizing the space contradicted Taylor's methods for mass production. The internal production line proved to be a successful way of viewing design for efficiency in the home, and yet held no similar qualities to the aesthetics of buildings for which it is globally known for. Another contradiction that was observed in the final design is that if the architect went too far in customizing the individual's exact movements, the dwelling became uncomfortable. This established two things. The first that it would make the client want to perform their daily task as quickly as possible so they could enjoy their relaxing time, which is essentially what this design hoped to achieve. The second was that the role of the architect to determine how much space the client needed was fundamental. In some aspects of the routine the prototype could hold true, and be hardly altered, and with other objects, it could not. For example, the client iterated that if they are hot and bothered after a shower they do not like being in a tight space, therefore the architect still kept the ecology of objects determined from the prototype in the same position, but also designed a flexible internal wall so the client could push it to relieve the spatial constraints.

The customized brief can only be successful through a comprehensive ethnographic study, so the architect knows specifically what he is designing for. It allowed for a comprehensive and successful generator for design. The movements could be transparently interrogated and design decisions discussed with Individual three at each stage.

Figure 4.35:
Photograph of
physical model

Chapter Five.

5.1 Discussion:

Efficiency was widely a concern in the late nineteenth century, when the economy of the country working together was important. Taylorism created an International Style and founded the production line to enhance efficiency. It was used by designers originally as a solution to the housing crisis after both wars. However both Taylorism and the production line were subject to a lot of criticism due to international style. This is because a designer cannot apply one mass produced design to society and expect them to be able to use it in the same way. In the design world, it has been proven that as a whole, society desired customization to an individual's requirements and preferences. Levittown, and its subsequent personalisation over time, is an example of this. Furthermore both Taylorism and the production line used rationalism is a way of ordering designing, which resulted in dehumanised systems of operation.

Taylorism inspired the application of addressing movement efficiency within the home. Using Taylors principles and adopting the production line as a way of viewing routine in the home was used by architect Margerette Schutte-Lihotzky. She proved that movements in the home can be grouped and designed for in order to create a more efficient design. However, she did not use ethnographic stud-

Figure 5.1: Photograph of physical model

ies gain a good understanding of how her intended users operated. This was a fundamental principle of Taylor's teachings.

A new contemporary layout that addressed the user's requirements was sought after in the mid twentieth century. At the turn of the twenty-first century micro architecture is a new phenomenon which is once again seeking to redefine the user's inhabitation and create movement efficient spaces. Due to this trend, architects are being forced to address the relationship to the body through designing in small spaces. Space is becoming more precious in inner cities so it is fundamental how it is designed. Architects need to re-evaluate their role in the profession and view the shift the requirements of their training as an opportunity to explore.

Once again, designers need to consider to opportunity of creating a home that can facilitate the social changes of the twenty-first century. The application of viewing the production line as the routine in the home which can be optimized, allows for a home to speed up chores resulting in more leisurely time; something that a lot of busy inner-city dwellers do not get much of.

The research motivation of the design concept worked very well. It was evident the architecture benefitted from the architect thoroughly understanding the clients inhabitation. However, the biggest inconvenience is that performing ethnographic studies is a very time consuming process for the architect to undertake. As the research was undertaken it was realised it that a faster way of performing the ethnographic studies would be appropriate. Furthermore, the clients involved were more than willing to have their inhabitation activities documented, however not all clients would be open to having their lifestyle interrogated. There are also issues of privacy and accuracy that could provide some discrepancies in the data, for example, if the clients were acting differently around the camera, such as being tidier. Therefore it is fundamental that the client understood the importance of 'normality' of routine when on camera and that they were willing participants.

Figure 5.2: Photograph of physical model

5.2 Conclusion

This thesis has proven that the home can be designed to suit our contemporary lifestyles. Additionally, the home can serve a purpose that is to facilitate in efficiency of living. It has highlighted the potential of this way of designing for architects and displayed examples where designing for movement efficiency has been used successfully in the home. It did this through adopting an industrial technique of Taylor's production line, an applying it to the home. However, it did not adopt the technique without critical analysis of Taylor's methods, resulting in an established a viewpoint of customization.

The principles of Taylorism proved to be successful tools to base this research around in order to achieve movement efficiency. It allowed the design to have a strong focus in achieving optimal living. Although, Taylorism was primarily designed to be applied to mass production, the idea of applying his method through a customized technique proved to still work. This technique, whilst very time consuming, did result in a prototype that established the bones for a residential dwelling which was a tool for living.

This thesis has also discussed the approach architects have taken to understand new ways of approaching interiorities, in the form of micro architecture. Micro architecture is a contemporary manifestation of Taylorism which facilitates an optimized routine, and social changes. It should be looked at as a precedent for twenty-first century architects designing inner-city dwellings.

The formulation of the brief has not only created a new system of designing for efficiency, but it also for architects to understand a contemporary layout. This system does not expect the resident to subject oneself to society's expectations of how to dwell, but rather serves to facilitate the client's current living style as best as possible. Through the ethnographic experiments the architect performs, a relationship is formed. One where the architect can holistically gauge what the clients inhabitation needs are. A new understanding and freedom of design is also created where the architect can strip the

Figure 5.3: Photograph of physical model

client's requirements back and re establish what they need in their home. Architects are not constricted by standardized sizing's. The dwelling designed from the prototype does not allow for any space to be wasted. Through this process, the brief has successfully integrated Taylor's production line as a way of optimizing contemporary residential routine. This mindset is potentially a significant way for architects to approach residential inner-city designing in the twenty-first century.

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Figure 2.30 Photograph, unknown. **Joe Colombo's Total Furnishing Unit.** Ambasz, Emilio. *Italy: The New Domestic Landscape*. Italy: New York Graphic Society Ltd., 1972: P. 176.

Figure 2.31: Photograph, unknown. **Joe Colombo's Total Furnishing Unit.** Ambasz, Emilio. *Italy: The New Domestic Landscape*. Italy: New York Graphic Society Ltd., 1972: P. 174.

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MEMORANDUM

TO	Lauren Gasson
COPY TO	Linda wong
FROM	Dr Allison Kirkman, Convener, Human Ethics Committee
DATE	09 September 2010
PAGES	1
SUBJECT	Ethics Approval: No 17942 To investigate the spatial efficiency within a micro residential context by analyzing the routine movements and ergonomics of individual users

Thank you for your applications for ethical approval, which have now been considered by the Standing Committee of the Human Ethics Committee.

Your applications have been approved from the above date and this approval continues until 02 December 2010. If your data collection is not completed by this date you should apply to the Human Ethics Committee for an extension to this approval.

Best wishes with the research.

Allison Kirkman

Convener

(on University letterhead)

VICTORIA UNIVERSITY OF WELLINGTON
CONSENT TO PARTICIPATION IN RESEARCH

Title of project: **To investigate the spatial efficiency in a micro residential context by analyzing the routine movements and ergonomics of individual users.**

I have been given and have understood an explanation of this research project. I have had an opportunity to ask questions and have them answered to my satisfaction. I understand that I may withdraw myself (or any information I have provided) from this project (before the 25/11/2010 when the work is due to be printed) without having to give reasons.

I understand that all information I provide from the video tapes will be kept confidential to the researcher (Lauren Gasson). Furthermore all material from the interview will be kept confidential to Lauren Gasson, the supervisor (Linda Wong) and the person who transcribes the tape recordings of our interview.

I understand the published results will not use my name, and no opinions will be attributed to me in any way that will identify me. I understand that all the video tapes, including the interviews (unless indicated that I would like returned to me) will be destroyed two years after the end of the project (02/12/2012). Up until which time they will be kept in a confidential file on a hard drive with a restricted password of which only Lauren Gasson has access.

I understand that the data I provide will not be used for any other purpose or released to others without my written consent.

I agree to take part in this research

Signed:

Victoria University of Wellington Human Ethics Policy

Name of participant:

Date:

Participants contact number:

Participants email address:

Please state if you would like a copy of the:

- ☐ Transcripts
- ☐ Summary of data
- ☐ Final publication

(on University letterhead)

Participant Information Sheet for a Study of Household Tasks

Researcher: Lauren Gasson: School of Architecture, Victoria University of Wellington (VUW).

I am a Masters student in Architecture at Victoria University of Wellington. As part of my post graduate degree I am undertaking a research project leading to a thesis by design. The project I am undertaking is examining the tasks and movements of individuals in the household. The University requires that ethics approval be obtained for research involving human participants. I have recently obtained ethics approval for this study.

I am inviting men and women whether living alone or with a partner, with or without children, to participate in this study. Participants will be asked to be video taped during their daily routine to establish the movements and activities they perform in the household. This will be done over a 24 hour period. The participants will be then interviewed for approximately an hour (see interview questions attached).

It is very important for participants to act as though the camera is not there. It will be out of the direct line of view, in an attempt to not be a constant reminder. There will be two cameras located in the dining/living/kitchen and one in the hall way and facing the sink, and only the sink, in the bathroom. This equals a total of four cameras. Should the sink have a mirror above it, the cameras will not face the mirror. If you have concerns about the positioning of any of the cameras, please consult me and we can discuss removing one or more of them until you are comfortable.

Should any participants feel the need to withdraw from the project, they may do so without question at any time. Should the participant wish to withdraw the information they have provided, they can do so before the data is printed on the 25/11/2010. Just let me know as soon as possible.

Responses collected will form the basis of my research project and will be put into a written report on an anonymous basis. It will not be possible for you to be identified personally. Only grouped responses will be presented in this report. All material collected from both the video tapes and the interview will be kept confidential. No other persons beside me will view the video recordings of your movements. No other person besides my supervisor (Linda Wong), the transcriber of the interview, and me will view the interview. All the video tapes, including the interview tapes will be destroyed two years after the end of the project up until which time they will be kept in a file on my hard drive with a restricted password.

The thesis with your anonymous data will be submitted for marking to the VUW School of Architecture and final work will be displayed in the VUW 2011graduate masters exhibition. It will then be deposited in the VUW Library. It may also be used for dissemination at academic or professional conferences.

If you have any questions or would like to receive further information about the project, please contact me at lmgas-son@gmail.com or my supervisor, Linda Wong, at the VUW School of Architecture or via email at lindafieldwong@gmail.com.

Lauren Gasson Signed: