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Effect of Self Accountability on Self Regulatory behaviour - a Quasi Experiment

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ABSTRACT

Individual's accountability to self leads to self regulatory behaviour. A field experiment afforded an opportunity to test this relation, given that external accountability conditions were absent. A single group pre-test/ post-test design was used to test the hypothesis. A group of full time resident management students, n ≈550, take four meals during the day in the institute mess. As a part of experiment, the food wastage in form of leftovers in the plates of subjects was measured. As a pre test, the measurement occurred at two levels. Subjects could see how much they are adding to the total waste by looking at weighing scale placed under a waste basket, and they could also see total waste figure for each of the four meals for the day and a day earlier displayed at a prominent place. After 105 days, the weighing scale under basket was removed, and as post test measurement, the total waste figures for four meals were noted down for another 72 days. A manipulation test indicated that the experiment has the desired effect of invoking self accountability in S's in the pre test phase, and diluting it in the post test phase. Time series analysis of pre test and post test data indicated that the wastage data decreased in the pre test phase. However, the post test waste data showed an increase over a period of time. The results indicate that accountability conditions like social norms invoke self accountability cognitions leading to self regulatory behaviours in individuals.

Effect of Self Accountability on Self Regulatory behaviour - a Quasi Experiment

INTRODUCTION

Accountability to Whom: Others and/or Self

In the social set up people live in, decisions and actions do not exist in vacuum but affect others. Decision makers are answerable to people who are affected by these actions. This answerability is termed as decision makers' accountability and is a universal feature of natural decision environment (Tetlock, 1985). Frink & Klimoski (1998) defined accountability as "perceived need to justify or defend a decision or action to some audience(s) which has potential reward and sanctions power, and where such rewards and sanctions are perceived as contingent on accountability conditions" (p.9). Thus decision makers justify their decisions and actions to the 'audience' which evaluates them against some standards and expectations. These standards are determined by formal rules, or informal norms and values related to specific decision or action. While formal rules guide individuals' actions and decisions in many situations, it is impossible to frame rules for every conceivable situation even in relatively closed system like organization, leave aside broader social set up. In majority of situations in which individuals find themselves, certain unwritten norms, morals, or values form the standards. Decision maker feels accountable because the 'audience' control certain rewards and sanctions which one has to bear based on above evaluation. These rewards and sanctions can take tangible and intangible forms such as status, image, group membership, money etc. Tetlock (1985) identified three motives for people to take cognizance of accountability: protect and enhance social image, protect and enhance self image, and secure control of desirable resources. These motives are often complementary and mutually reinforcing.

For a given action and associated consequences, people are answerable to multiple 'audience'. Typically at work place, decision maker is answerable to superiors, subordinates, peers; in family to spouse, parents, children; and in society to neighbours, institutions etc. This set consists of only the external 'audience', but decision maker is answerable to internal 'audience' i.e. self, as well (Schlenker & Weigold, 1989). In every situation internal and external accountability is at work. Different stakeholders have different stakes in a given situation and often these do not align. In order to meet accountability conditions due to these stakeholders, individuals face web of accountability forces often pulling them in multiple and opposing directions. These multiple forces are determined by structural, social, interpersonal, and ethical contingencies embedded in the decision situation. Thus decision makers have action choices. They decide on the action which fulfils accountability force which is most salient and strongest (Frink & Klimoski, 1998). In other words, individuals take decisions depending on which constituency they feel most accountable to, including self. Their primary goal is to maintain a positive regard of important audience(s) to whom they feel most accountable (Tetlock, 1985). For a decision maker, the most important audience is the one which holds maximum potential for his/her rewards and sanctions. Though the above heuristic appears simple, decision makers more often than not find themselves in situations where they face equally strong accountabilities in opposite directions. Thus we find phenomenon like politics, ethical dilemma etc.

PAST RESEARCH ON ACCOUNTABILITY

Research on accountability in management and psychology streams is scant. Frink & Klimoski (1998) found that search for accountability literature in management and psychology streams resulted in lesser than fifty references. Lerner & Tetlock (1999) were the first ones to comprehensively review accountability literature across different streams. They

noted that in recent times accountability has been studied extensively in other fields like health, education, politics, but not much in psychology and management. Further, most of the studies in psychology stream have been laboratory studies which have limitations in terms of generalizability. In order to advance accountability research, there is a need to conduct more field studies.

Empirical research has shown both positive and negative effects of accountability on people's actions and decision quality. Lab studies prove that it reduces judgmental biases such as primacy effects (Tetlock, 1983), reduces overconfidence in personality prediction (Tetlock & Kim, 1987), reduces sunk cost effects (Simonson & Nye, 1992), and leads to more accurate judgments and decisions (Ashton, 1992; Brtek & Motowidlo, 2002; Mero & Motowidlo, 1995). On the negative side, it can inflate sunk cost if decision maker is already committed to a decision (Tetlock, Skitka & Boettger, 1989), increases stereotyping (Gordon, Rozelle, & Baxter, 1988) and impression management (Ferris et al., 1997), shifts decisions towards undesirable preferences of strong constituencies (Adelberg & Baston, 1978), and forces decision maker to even consider irrelevant information compromising decision quality (Tetlock et al., 1989). This research has shown that positive effect of accountability is most likely to be activated when agent is accountable to a audience whose views are unknown, who is interested in processes/procedures rather than specific outcomes, who is interested in decision quality, who is reasonably well-informed, and who has a legitimate reason for inquiring into the reasons behind participants' judgments (Lerner & Tetlock, 1999). But above research has tested the effect of external accountability conditions while ignoring its internal counterpart, i.e. self accountability.

SELF ACCOUNTABILITY AND ITS DRIVERS

As with external accountability, decision makers' self accountability influences their actions and decisions. Self accountability can be defined as the felt need to justify one's own actions and decisions to oneself in order to confirm or enhance self identity or image shaped by strongly held beliefs and values. It leads to individual's self regulatory behaviour, whether external regulatory and accountability conditions exist or not.

Individual Values and Self Accountability

If decision makers are not able to justify their actions to themselves, they experience sadness, disappointment due to discrepancy in their actual and ideal self (Higgins, 1989; Schlenker & Weigold, 1992). Individuals create this ideal-self based on certain beliefs and values they strongly hold. Thus decision maker's value system affects their self regulation needs. Values have been defined as "general standards by which we formulate attitudes and beliefs and according to which we behave" (Posner et al, 1987, p.376). Rokeach (1973) argued that values can be classified into terminal and instrumental types. "Terminal values are values that lead to desirable end-state of existence (e.g. a world of peace, wisdom), whereas instrumental values describe preferred modes of conduct (e.g. honesty, love)" (Finegan, 1994).

Ethical decision making field substantiates the effect of individual variables related to personal values, moral cognition, and personality on decisions (Beu, Buckley & Harvey, 2003; Maheshwari & Ganesh, 2006), especially in case of ethical dilemmas. Maheshwari & Ganesh (2006) identified following individual level or intrinsic variables affecting ethical decision making- moral awareness, individual values, cognitive factors (e.g. moral development), individual personality differences, and demographic differences. Finegan (1994) conducted an experiment and found that different individuals have different value

preference which affects their judgment of morality of behaviour as well as behavioural intentions. They considered instrumental values in their experiment because, as opposed to the terminal values, these have clear behavioural guidance. Values have been shown to affect managerial decisions (England, 1975), and perceptions of business ethical dilemmas (McDonald & Gandz, 1991, 1992).

Individual's Moral Development Stage and Self Accountability

Cognitive moral development field (Kohlberg, 1969) is another sub area demonstrating the effect of individual value system on ethical decisions. Kohlberg proposed that individual's sequentially progress through various moral development stages. A stage provides them a basic framework to think through and take decision in a particular decision event, typically in case of ethical dilemma. This framework provides prescriptive guidelines about what is right or wrong in a decision situation (Trevino, 1986). Kohlberg's six stages are divided in three levels- pre-conventional, conventional, and principled (Trevino, 1986). In the pre-conventional stage individual's take decision which avoids punishment, which safeguards their self interest, and which focuses on instrumental exchange or fair deal. Conventional stage involves more consideration of other's views, focus on interpersonal and social accord, and is about upholding laws. People follow laws except in extreme cases when these contradict well defined social responsibilities. Principled stage is more about upholding universal ethical principles. Individuals think and decide beyond prevailing norms, laws, or authority (Trevino, 1986). There is strong empirical support for the Kohlberg's model. Moral development is negatively related to cheating, negatively related to obedience to harmful authority (Kohlberg, 1969), positively related to helpful behaviour (Kohlberg & Candee, 1984). Snarey's (1985) review of 45 studies established the universality of sequential nature of moral development stages across cultures. Kohlberg's studies also found that continued education results in moral development (Trevino, 1986). Thus in the principled stage

individuals feel more accountable internally while in first two stages they will feel more accountable externally.

Individual's Disposition, Demographics and Self Accountability

Certain personality traits like self monitoring, type A personality, internal locus of control, and Machiavellianism hold certain values dearer than others, and past studies (Chen, Shecter, & Chaiken, 1996; Hegarty & Sims, 1978; Perry, Kane, Bernesser, & Spicker, 1990) show empirical support for their effect on ethical decision making. For example self monitors, who have higher external locus of control, feel more accountable externally while those with internal locus will feel more accountable internally.

Demographics also influence one's value system and hence their self accountability. In organizational context, younger employees, with lesser work experience, and lower responsibility are more ethical than older employees with more responsibility, work experience and income (Roozen, 2001). This may indicate that younger lot is more self accountable. Similarly, females stereotypically have been found more ethical (Sims & Keenan, 1998) and may be more self accountable.

Social Norms and Self Accountability

One more major factor affecting one's values and beliefs is the prevailing social norm related to an issue or decision (Trevino, Butterfield, & McCabe, 1998). Wherever there is high social consensus that an act or decision is good or bad, individual will tend to feel more accountable internally and externally. Maheshwari & Ganesh (2006) studied successful implementation of 'code of ethics' at Tata Steel, an organization reputed for its adherence to ethical practices. They found that ethics got institutionalized in the organization through a three stage process- creating awareness and building consensus about ethical practices, creating formal or informal monitoring mechanism (preferably latter e.g. family pressure), and rewarding or punishing the ethical or unethical behaviour respectively. The study

illustrated the importance of creating awareness and building consensus. Outside such formal set up, in society at large, there exits norms and consensus about certain universal values, e.g. honesty. But creating awareness about these norms is essential, so that individuals feel self accountable and regulate their behaviour accordingly.

SELF ACCOUNTABILITY AND INDIVIDUAL DECISION MAKING OR SELF REGULATION

In the current study it is proposed that, in the absence of strong external accountability conditions, it is individuals' self accountability that affects their decisions and actions. And individuals feel this accountability because of the values they hold and their need to maintain their self and social image. In a given decision context and in the absence of external accountability conditions, it is further proposed that self accountability explains the effect of variables discussed above i.e. why individual's moral development stage, personality factors, demographics, and norms affect their decision making. This argument is represented in the model form in figure1. While it will be interesting to test the complete model, we are focussing only on the effect of self-accountability on individual decision making and behaviour. We are controlling for the individual differences and assessing whether self accountability condition affects people's behaviour as a collective.

Insert Figure 1 about here

The influence of self accountability on individual's behaviour can be understood by research in the self regulation field. Self regulation is a conscious effort on the part of individuals to align behaviours with established or preferred standards (Vohs & Baumeister, 2004). It involves directing behaviour towards apriori goal states considered necessary or

appealing. Therefore, in the current research reduction of waste by an individual is a self regulatory effort when faced by a social norm. Felt accountability explains the cognition underlying the effect of norm on behaviour. Carver & Scheier (1982) argued that "directing attention to self, when a behavioural standard has been evoked by the nature of one's role or setting, engages the comparator at the level of control that is superordinate. The result is tendency to compare one's perceptions of one's present stae or behaviour against the standard, leading to a reduction of perceptible differences between the two" (p. 120).

However, in the current experiment, due to repetitive nature of stimulus in form of daily wastage data, the accountability cognition progressively influences individuals' behaviour. The control model of self regulation (Carver & Scheier, 1982) provides appropriate explanation of this progressive behaviour. According to this theory, the basic unit of cybernetic control is the negative feedback loop, which effects the reduction between present condition and the reference value. And it is cyclic achieving progressively closer outputs to the reference value. Therefore it is hypothesized that,

Hypothesis1. In the absence of external accountability conditions, individual's self accountability contingency will regulate individual's behaviour.

Before we discuss the study design, it needs to be mentioned that we have considered a deontological view of values, ethics, and self accountability i.e. individuals hold certain values and ethics irrespective of their consequences or in other words a worldview of "virtue as its own reward" (Turillo, Folger, Lavelle, Umphress, & Gee, 2002). This view maintains that an action's morality is independent of its consequences e.g. criteria of good for maximum populace. Behaviour is assessed for ethicality by examining the rules and principles which guide such behaviour. Thus we have not discussed certain important

variables which take into account the consequences of behaviour, and which have been shown to affect ethical decision making. One example is moral intensity of issue. We have considered, social consensus, one component of moral intensity, but have not considered other components – magnitude of consequences for victims (or beneficiaries), probability of effect (probability of action and its detection by others), proximity with victims (or beneficiaries), and temporal immediacy of consequences (Jones, 1991). Our method ensures that consequences and above factors are not salient for individual decision.

METHOD

Procedure & design

A naturally occurring quasi experiment afforded an opportunity to study the hypothesized effect. In a management institute situated in Western India, 550 students stay inside the campus and take their meals in the institute mess. Meals are served four times-break fast, lunch, evening tea with snacks, and dinner. Meals are served in buffet style and students are free to take as much as they like in their plates or help themselves with as many servings as they like. Mess management noticed that students often leave huge amounts of eatable meals in their plates apart from leftovers like banana and egg peals. Interestingly, the wastage increases considerably whenever there is a special meal on offering e.g. on Fridays. This wastage not only causes considerable loss to the mess contractor and institute, but also caused problems in washing and disposing off the waste. In order to improve the disposal system as well as monitor and measure this wastage, the mess committee placed a waste basket in the mess and instructed students to just throw off the leftovers in it. Later on they placed this basket on a weighing scale so that each individual can notice how much he/she is adding to the waste. Also mess people started displaying day's total and mealwise waste

figures alongwith corresponding figures for the last day on a board placed at a strategic location. In addition, daily data was recorded in a computer in an excel file.

Thus a condition was created where each student can observe the amount he/she is wasting and the amount group is wasting. Now it is a well accepted value and norm that one should not waste food, especially in a poor country like India. Thus it is assumed apriori that 'no wastage' is an important instrumental value. This assumption will be checked with the students at the end of the experiment. As per the self accountability conceptualization discussed above, this intervention created a condition where individual may feel accountable to themselves for wasting meal. Also individual student was not placed in any kind of external accountability condition because there was no penalty and reward associated with the individual or total wastage. Only individual student can themselves observe the wastage amount they are adding. Sometimes a few friends may compare their figures, but it was rarely observed by authors. Thus absence of external accountability is a safe assumption. These assumptions about accountabilities will be checked with the students at the end of experiment.

In order to test hypotheses, there is a need to create conditions of high and low self-accountabilities. Data is available from day 1 of the intervention and it is expected that in phase 1 the waste figures will come down progressively as more and more students feel accountability pressure. But this alone does not vary the accountability condition. In order to do so, after 107 days in phase 1, the weighing machine was removed in phase 2. Of course the total waste was weighed separately and it was also displayed on the board. Thus the 'self accountability' condition was removed in phase 2. But the other conditions remained same in phase 2 as in phase 1. Data was collected for another 97 days in phase 2.

It is expected that in phase 2, the waste figures will again start rising, if self accountability had an effect on students' behaviours in phase 1. There is equally probable

alternative expectation. After phase 1 it may just happen that scale or no scale, the waste figures may not rise at all and remain at or near the stable low level achieved at the end of phase1. The explanation for two alternative responses comes from behaviour modification literature (Luthans, 2005). Once the subjects are made aware of the wastage they cause, each may become more conscious of meals they take in their plates. This may develop into a habit which is an automatic rather than cognitive controlled response. If figures reflect such a situation then it will be checked at the end of experiment with the students. Of course it would not mean that self accountability is not working. But self accountability being more cognitive or controlled mind state, it may not be in operation in case of effect of 'habit'. Thus in such a scenario it can be concluded that self accountability acted initially, but once subjects acquired 'habit', it stopped operating. Thus in the designed experiment, two accountability conditions are the treatment conditions. There in no separate control group. Wastage per person represents the dependent variable.

There are few variables which need to be controlled to test the hypothesis. First one is the preference for different menu. It is expected that the waste will vary from menu to menu as well, because generally the group likes some meals more than others. The menu more or less repeats every week, and thus a weakly fluctuation is expected.

Though self accountability is an individual construct and manipulation is also individually focussed, the measurements are aggregated at the group level, and thus group is the unit of analysis. The large sample size of around 550 students ensures that the individual factors (see dotted boxes in figure 1) are randomized. Also students fall in narrow range of age groups, are predominantly males (88%), and go through highly homogenous day routines, other factors may not be much salient as far as their eating habits are concerned. More so because they face quite homogenous acculturation (e.g. in terms of academic/non-

academic ethical conduct) at the institute, and this factor may also help in nullifying individual differences.

The sample constituted 12 % female students, the average age was 26.5 years with minimum and maximum of 22 and 32 years respectively.

Manipulation Check Method

In order to check whether intervention had the intended effect, subjects were asked to fill up a short online questionnaire after the experiment (see appendix A for questionnaire). It contained five items to check whether introduction of the weighing scale had any cognitive and behavioural effect on mess members' food wastage habits. It also checked whether removal of weighing scale reversed this effect. All but two items were measured on 6 point scale ranging from strongly agree to strongly disagree. The questionnaire is provided at annexure.

This questionnaire was displayed on two mess announcement notice boards on the students' intranet- DBabble on February 28th, 2007. After four days a reminder was put on these notice boards. The questionnaire remained active on these notice boards for a period of one month. A total of 54 respondents answered, representing 11% response rate based on the enrolment figure for the month of February. The reasons for lower response rate could be examinations and placement activities happening in the first ten days of March. In fact after this period, second year MBA students (almost 50% of population) left the campus.

Data Organization and Treatment

We have plotted the time series trends of wastage per person (in gms per person) for dinner, lunch, and total meals (figures 2, 3, and 4). These plots show trends for two periods – wastage trends for 105 days after introduction of weighing machine, and wastage trends for 65 days after weighing machine was removed. For calculating wastage per person for a given month, the number of persons eating during any meal was taken to be the numbers enrolled in

the mess at the beginning of every month. Due to limitations of resources, it was not possible to physically check how many persons ate during every meal. But it is a safe assumption because nature of MBA programme demands that students stay on the campus when their term is going on. But then there are other known and random factors which influenced the wastage data. Before making statistical inference from the data, we have tried to remove the effects of these fluctuations to smoothen the trend.

Events. During the period of investigation certain events took place in the institute which brought additional persons from outside eating in the mess for a period of 3-4 days at a stretch. These events included Chaos during , Confluence during, and Amaethon during . We have dropped data for first two events, because there was no way to know how many persons were eating in the mess during these events. In any case these included considerably large number of additional persons eating in the mess, and since these were not part of the intervention, it is suitable to drop these days from analysis. For last event since the numbers were lesser, we have taken an informed estimate for number of additional persons eating during the event.

Term off. Whenever the term ended for MBA students, they had a week off and most of them travelled to their home towns. During these days, we deducted numbers equal to batch size from the total persons enrolled at the starting of month. Additionally we cross checked with mess records the number of 'mess opt out' forms filled up by such students for these periods. Mess rules require that students moving out of campus for a period of atleast one week need to fill up 'mess opt out' form in order to get refund for that period. And since sum involved is considerable, it is assumed that most of those who moved out filled up this form.

Specific out of campus courses. Then there are periods during which second year MBA students were out of the campus as a part of academic courses. For example, during

February first week, 25 students were away from campus as part of ERI course conducted outdoors, and during February 12- 18th, 30 students went out of campus as a part of 'khoj' team for a period of ten days. These numbers were accounted for in the calculations.

Other programmes. Apart from MBA programmes mess also catered to the students enrolled in other course. These students were also present on the campus for most of the period during the course of intervention. These include 30 members of faculty development programme who stayed in the campus during a period of 3 months from. Then there were 60 members of the management programme for defence officers who regularly ate in the mess for a period of 6 months from . Additionally, there are around 35 fellow programme in management (FPM) students who were also regular members of the mess during this period. These numbers were taken into account, and term breaks, wherever applicable, were also accounted for in the calculations.

Specific events. Lastly, there are certain events, in which the members were involved, and which has affected the figures. It is difficult to put exact numbers to such events, but while making inferences and explaining the trends these have been take into account. These included summer placement for first year MBA students during , and pre-placement talks for second year MBA students in the month of February. The latter events mostly took place in the evening and involved students ranging from 40 -60 members who more often than not skipped dinner if they had snacks during such talks.

Focus on dinner data only. We are presenting data for all meals- lunch, dinner, breakfast, and high tea. Data for last two meals has been included in the total meal wastage figure and not shown separately. Looking at the data we did n't consider appropriate to analyse these two meals separately because they represented 25 % of the total daily wastage and had lot of random noise due to number of factors. Many students randomly skipped break fast or ate it quickly because they had to attend classes in the morning and given the late night

working habits at the institute many struggled to reach classes in the morning. Also we noticed that during high tea students visited mess randomly to eat snacks. On the other hand dinner alone accounted for 42 % wastage and lunch accounted for 33 %. We focus on dinner only because again in case of lunch there is much more random noise which is difficult to account for. For example, MBA first year students undergo unannounced quizzes 2-3 times a week just after lunch time and these are announced just before lunch. Students are not only anxious, but many tend to skip lunch. Then there are other visitors during working hours who visit mess for lunch on cash payment basis. On the other hand during dinner students are relaxed, there are practically no visitors, and thus the data is more valid representation of the phenomenon under study. Additionally, special meals are prepared mostly in dinners, and which are important for study because these show large wastage figures. Even then a comparison of three figures reveals that overall trends are similar for all meals. Thus inferences for dinner can be extended to other meals as well.

Actual and moving average plots. In order to smoothen the trend we are using moving average data in conjunction with actual data for inference. Each figure shows two plots- one enumerating the actual wastage and the other showing weekly moving average. We used weekly moving average because many activities related to mess happened over a cycle of week. For example menu repeated (not exact replication) over a week's time, e.g. every Monday, Wednesday, and Friday menu included non-vegetarian dishes. Then the MBA and other students had their term off for a period of week.

Initially we also wanted to account for people's preferences for certain menus over others as well as preparations, but because menus were hardly replicated exactly, it was difficult to get this data. Still we studied wastage data in conjunction with meals menu to get better insights. In any case it only caused fluctuations in daily data, but the overall trends have been unmistakable (refer figures 2, 3, and 4).

RESULTS

Wastage trends in Phase 1: Weighing Scale in Place

In figures 2, 3, and 4, series 1 corresponds to the phase 1 of the study, i.e. when weighing scale was placed below waste basket for 105 days between August 9th and 21st November. The three figures respectively represent trends recorded for the total wastage per person data, dinner wastage per person data, and lunch wastage per person data. A visual check on wastage trends for series 1, especially the weekly moving average, across three figures reveals a close match in the wastage data trends. Although actual data fluctuations differ across three, the long term decreasing trend is consistent. Interestingly, from 22nd September to 4th October the three show similar unexpected increase in moving average and absolute data. We searched for a viable explanation of this discrepancy. One plausible explanation could be related to one week vacation post first term for the MBA first year students. It was noticed that this glaring aberration lasted for a period of two weeks immediately after these students returned from one week vacation. Importantly, this is the first vacation for MBA first year students after they had joined the institute and undergone the most stressful MBA term. It seems after spending time at their homes, it takes sometime for these students to adjust to the mess food again. To check the validity of this explanation, we compared wastage figures for similar period post second one week vacation for these very students. Thus looking at one week between 8th January and 15th January, 2008 post one week vacation, a similar increasing trend is noticeable, though not a very significant one. But similar effects were not evident for MBA 2nd year students. Therefore, one can only conjecture that over period of time students adjust better to such changes. No other plausible explanation could be found.

Insert Figures 2, 3, & 4 about here

Wastage trends in Phase2: Weighing Scale Removed

In figures 2, 3, and 4, series 2 corresponds to the phase 2 of the study, i.e. when weighing scale was removed below the waste basket for 71 days between November 22nd and 31st January. During this period two events- Confluence and Chaos, were organized which brought substantial number of visitors from outside who temporarily ate in the mess. These events were organized between November 23rd to November 27th and between 26th to 28th January respectively. In order to remove this extraneous effect, we dropped these periods from analysis. Another event, Amaethon, was organized between December 19th and 21st, but we kept figures for this period in our analysis, because number of temporary visitors was relatively very small (6-9%). After removing these periods, it is evident from three figures that trends for per person total, dinner, and lunch wastage is similar and increasing during phase 2.

Based on visual comparison of actual and weekly trends, we can infer that during phase 1 when the weighing scale was placed, the wastage figures exhibited a decreasing trend. But in phase 2 this trend reversed and actual wastage started increasing. Therefore, there exists preliminary support for the self accountability hypothesis.

Time Series Analysis

In order to test statistical significance of the visual trends noticed across two phases, we conducted time series analysis for two phases separately.

Series 1 Stationarity and Model Specification. Before testing any particular model, the series was checked for stationarity using Dickey-Fuller unit root test. In order to

incorporate distinct possibilities, three distinct models, as suggested by Gujarati (2003), were tested. These are given below:

Model 1: $\Delta yt = \alpha + \delta yt\text{-}1 + \beta 2\, t + \varepsilon$

Model 2: $\Delta yt = \alpha + \delta yt\text{-}1 + \varepsilon$

Model 3: $\Delta yt = \delta yt\text{-}1 + \beta 2\, t + \varepsilon$

The null hypothesis is $\delta = 0$, i.e. there is a unit root, and series is non- stationary. According to **Dickey-Fuller** test statistic, if t value for δ is $> t_{cr}$ ($=\zeta$), then null hypothesis is rejected and series is stationary. All three models show stationary properties based on **Dickey-Fuller** test statistics given in table1.

Insert table 1 about here

In the next step, we plotted correlograms for autocorrelation function (ACF) and partial autocorrelation function (PACF) of y_t. These plots are shown in figure 5. It is evident from these plots that y_t is influenced by y_{t-2} and y_{t-7}, i.e. a lag effect of alternate day and week respectively. These effects are not difficult to understand. Firstly, non vegetarian menu repeats every alternate day (i.e., Monday, Wednesday, and Friday), except for two day gap at week end. Given that almost 46% students eat non vegetarian meals, the alternate day waste figures are expected to be related because of unavoidable, almost fixed weight of leftover in form of bones. Weekly lag is also expected because meal menu repeats itself over a cycle of one week.

Insert figure5 about here

Alongwith these lags, we expect that yt will decrease with time due to the hypothesized effect, which is evident in the graphical plot shown in fig 5. We have also included one period lag term in the model. Our expectation was that, since last day's mealwise total wastage figure was displayed at a strategic location in the mess; it will have negative influence on the next day's wastage figure. In addition, to keep model simple, we assume a linear relation, although intuitively yt may decay geometrically, with maximum fall witnessed in the initial period and the decay rate falling down gradually. Therefore, we propose following ARIMA (3, 0, 0) model to represent series 1:

$$yt = \alpha + \beta 0 yt\text{-}1 + \beta 1 yt\text{-}2 + \beta 2 yt\text{-}7 + \beta 3\, t + \varepsilon \text{ ------ Equation 1}$$

The regression results (table 2) show a moderate explanatory power of this model with R^2_{adj}= .33 (F= 11.93; p<0.00). The ACF and PACF plots for studentized residuals (fig 6) fell within the 95% confidence interval, thereby proving that the model specification is adequate.

Insert table 2 and figure 6 about here

The regression coefficients reveal that yt-7 and t are the significant and influential independent variables. As expected, yt-1 and t have negative signs, whereas yt-2 and yt-7 exert positive influence on yt.

Series 2 Stationarity and Model Specification. For series 2, we are using the same model as specified in equation1. Before that, as for series 1, we conducted D-F unit root test for series 2 using all three models as in series 1 above. The results are given in the table 3 below:

Insert table 3 about here

Based on the D-F test, we conclude that series 2 is stationary, except when tested on model 3, which in any case does not match the specified time series model in equation 1.

In the next step, we plotted correlograms for autocorrelation function (ACF) and partial autocorrelation function (PACF) related to y_t. These plots are shown in figure 7. For series 2, the first, second and seventh lag values are not that influential as e.g. 5^{th} or 10^{th} lag values. However, none of the lag effects fall outside the 95% confidence interval. And theoretically the logic of 1^{st}, 2^{nd}, and 7^{th} lag effects still apply in case of series 2. Therefore we regressed yt for series 2 as per equation 1. The model explained insignificant proportion of variance in yt with R^2_{adj}= .07 (F= 2.18; p=0.082). The ACF and PACF plots for studentized residuals (fig 8) fell almost within the 95% confidence interval, thereby proving that the model specification is adequate.

Insert table 4 and figure 7 about here

None of the independent variables emerged significant[1]. The lag effect signs were also inconsistent with the expectations. For example, we expected positive signs for both yt-2 and yt-7, and negative for yt-1. This inconsistency is also reflected in the ACF and PACF plots for the two series. While for series 1, the first seven lag effects in ACF plot consistently fell on one side of the mean line, for series 2 these fell on both sides for series 2. As expected, time or date showed a positive effect, thereby confirming the reversal of series 1 trend of falling wastage figures. Thus we can infer that, after removal of weighing scale, the wastage data again started increasing. It is also evident from the progressively increasing amplitude of

[1] Based on ACF and PACF plots for dinner wastage figures for series2, yt-5 and yt-10 also seem to have influence on yt. Though there seems no logic for these effects, we included these lags also in eq 1 and ran regression again. Except that it improved R^2_{adj} to 17%, and ACF and PACF plots for residuals fell within 95% limits, time (t) remained insignificant but in positive direction.

variation in wastage data in case of series 2. It again revealed a reversal of trend observed in series 1 wherein the variation in wastage figures steadily fell after large initial variations. These trends are visible in the ACF and PACF plots for two series in figures 5 and 7.

Manipulation check results

As discussed in the method section, effect of weighing scale on students' response was checked using five items. Data (panel 1) shows that out of 54 respondents, more than 70% felt that placement of weighing scale did make them conscious about the waste they are adding. And they also agreed that it is the main reason for waste reduction. Almost 80% of respondents felt that after removal of weighing scale they have stopped noticing the total waste figures displayed on the board. Although they disagreed that they have stopped noticing the meals they waste in their plates. They also agreed that scale did have major impact on altering the wastage habits of the students. Almost 65% respondents replied that they did notice the removal of scale, and 60% noticed it in month of December.

Insert Panel 1 about here

Therefore, it can be inferred that placement of the scale did have the intended impact, and the waste trends and time series results are not spurious.

DISCUSSION

Evidence in support of hypothesis

The overall wastage data trends, wastage data variation trends, and time series analysis for the two series provide support for the hypothesis. When the weighing scale was in place, the moving average wastage data progressively reduced from 40gm/person to 15 gm/ person. After removal of weighing scale, it again increased to around 30gm/person. Corresponding figures for reduction of total wastage were 80gm/person initially to

40gm/person, and again an increase to 70gm/person. The time series analyses confirm these trends. After controlling for lag effects, for phase 1, the effect size of time on wastage data was negative and large at -0.354 ($p<0.01$). For phase 2, this size was smaller at 0.169, but positive. Therefore, we have reasonable confidence that these trends are a consequence of self accountability conditions.

The variation trends for two series also indicate support for influence of self accountability conditions on subjects' wastage behaviour. It is expected that when students are not put under self accountability conditions, their food wastage behaviour will be very erratic. But under accountability conditions, this behaviour may be more controlled. As is evident from figure, the high peaks at the beginning of series 1 gradually tapered down to almost levelled data variation nearing 22nd November. But after the removal of weighing scale the variation again seemed to grow.

To illustrate, we plotted per person total and dinner wastage data only for Fridays across two series. Now Friday dinners are special both for vegetarian and non vegetarian mess members. The waste figures for Friday invariably were higher and more erratic. The trends clearly reveal that, even for Fridays, initially the wastage data varied wildly and then steadied down along series 1. The data again started showing higher variations along series 2.

Insert Panel 2 about here

Therefore considering the evidence we have, and given that manipulation seems to have been effective, we can infer that self accountability condition indeed influenced the self regulatory behaviour of the subjects. The results also indicate a progressively improving or deteriorating response in series 1 and 2 respectively. It thus supports the Carver & Scheier's (1982) control model of self regulation. The results of series 2 also suggest that despite undergoing behaviour modification conditions and progressive change in behaviour, the

changed behaviour did n't persist as habit in series 2. The respondents of online survey also informed that majority of them have stopped noticing the cumulative waste figure displayed on the board in post test phase. It implies that the weighing scale functioned as an individual stimulus which made students conscious or self accountable, making them more observant about the wastage data as well as how large helpings they take and waste. Once the stimulus is removed the students seem to go back to earlier careless food eating practices, less observant of their food intake and waste behaviours. However, majority of them denied that they have stopped observing the amount of wastage in their own plates.

Limitations

The pretest- posttest design has generic limitations in terms of confidence in inferences we make compared to more robust control group – treatment group design. Due to the design limitations, it is necessary that other conditions which could have an influence on students' eating habit did not change in the pre test and post test phases of the study. As was discussed in earlier sections, the students' experienced similar conditions related to mess menu, work/ time schedules etc, across two phases. However, we cannot control for validity threats like subject maturation, adaptation, and extraneous factors like change in season etc. Therefore results of manipulation check are important, which do indicate the intended influence of the intervention. Second limitation relates to the manipulation check itself. Due to the limitation of online survey method, we could n't get set of individual responses. However the cumulative response data on each question indicated that the treatment has achieved its intended effect. Despite these limitations, this study provides evidence that in a field setting, conditions can be created which invoke individuals' self accountability which results in their self regulatory behaviour, even though external accountability conditions might be absent. In future the model presented in figure 1 can be tested more

comprehensively. Particularly interesting will be the interactive influence of personality and accountability contingencies on self regulatory behaviour.

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FIGURE 1.

Self Accountability Model

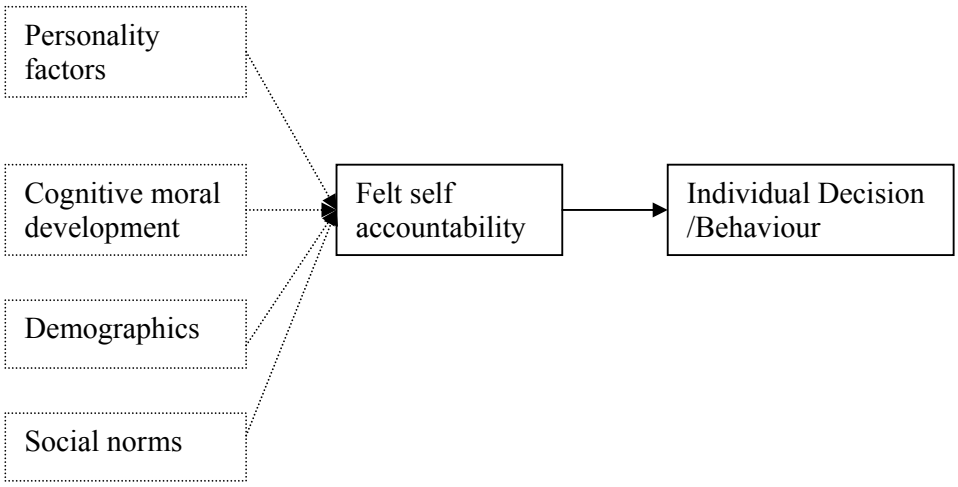


TABLE 1.

Dickey-Fuller test for checking stationarity of series 1.

Models	t value for δ*	Dickey Fuller t_{cr} (=ζ) at 5%	Stationarity ($t>t_{cr}$)
1	-12.2	-3.45	Yes
2	-9.31	-2.89	Yes
3	-3.38	-1.95	Yes

* yt-1 coefficient.

TABLE 2.

Regression of Dinner wastage (yt) for series 1.

Model	b	t
(Constant)		4.02
Dinnerlag1	-.07	-.74
Dinnerlag2	.07	.72
Dinnerlag7	.31**	3.21
Date	-.35**	-3.01

**p<0.05; *p<0.10

TABLE 3.

Dickey-Fuller test for checking stationarity of series 2.

Models	t value for δ*	Dickey Fuller t_{cr} (=ζ) at 5%	Stationarity ($t>t_{cr}$)
1	-6.6	-3.45	Yes
2	-6.4	-2.89	Yes
3	-1.24	-1.95	No

* yt-1 coefficient.

TABLE 4.

Regression of Dinner wastage (yt) for series 2.

Model	b	t
(Constant)		2.44
Dinnerlag1	.15	1.15
Dinnerlag2	-.21	-1.61
Dinnerlag7	.21	1.49
Date	.17	1.17

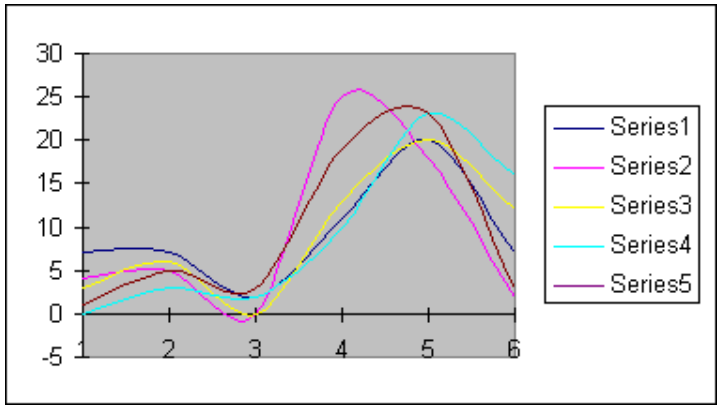
**$p<0.05$; *$p<0.10$

Panel 1.

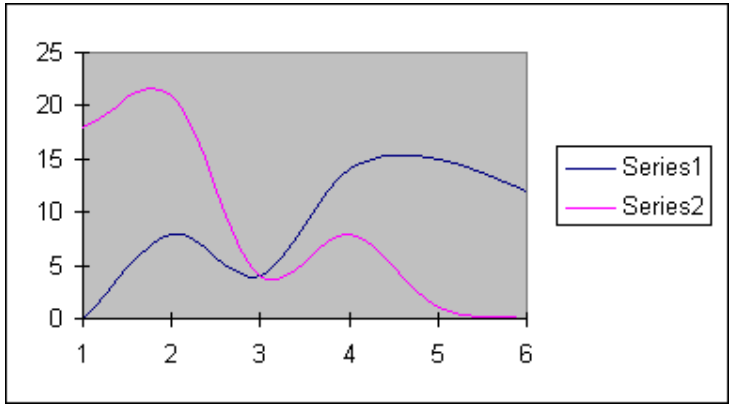
Manipulation check results.

No.	Items	N	Mean	S. d.	Median	Mode	% ≥ 66th%tile*
	Phase 1						
1	After weighing scale was introduced, I keenly noticed scale reading how much I am adding to the waste	54	3.94	1.63	4.5	5	70
2	After weighing scale was introduced, I keenly followed the wastage statistics displayed on white board.	54	4.00	1.24	4	4	83
3	I think weighing scale made me more conscious about the wastage	54	4.42	1.43	5	5	83
4	I think I consciously reduced wastage myself.	54	4.87	1.06	5	5	91
5	I think overall mess members reduced wastage because they became conscious of amount of wastage.	54	4.24	1.09	4	5	83
	Phase 2						
8	Currently I have stopped following the wastage statistics displayed on white board.	53	4.36	1.34	5	5	77
9	After weighing scale was removed, I have stopped noticing wastage (in my plate).	52	2.09	1.11	2	2	17
10	I do not think weighing scale can change individual wastage habits.	54	2.76	1.40	2	2	22

* ≥ 4



Phase 1 manipulation check response profiles

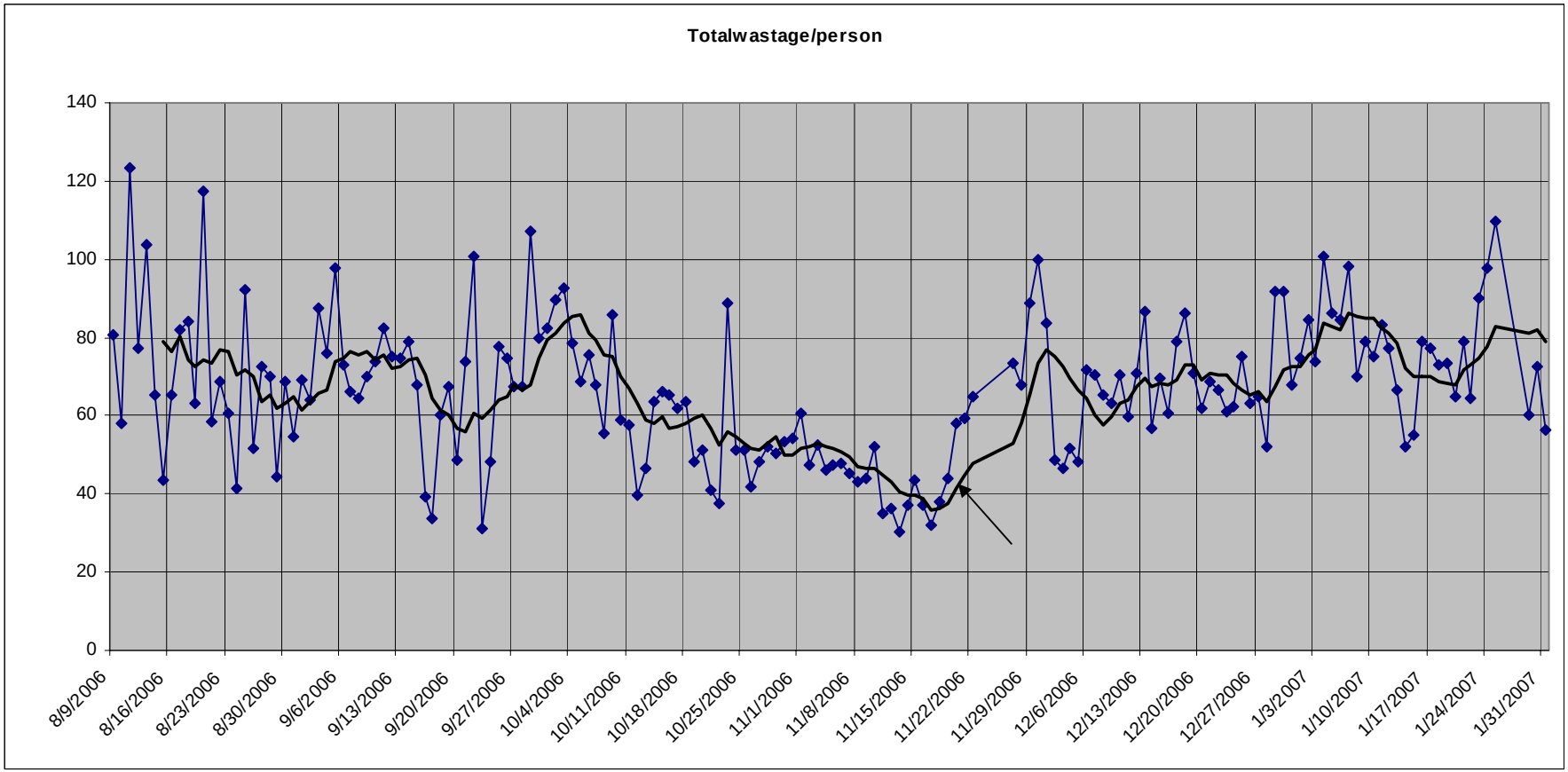


Phase 2 manipulation check response profiles

6	Did you notice removal of weighing scale (basket remained)?	Yes	34	64%
7	When did you first notice the removal of weighing scale?	Nov	2	4%
		Dec	18	42%
		Jan	12	28%

FIGURE 2.

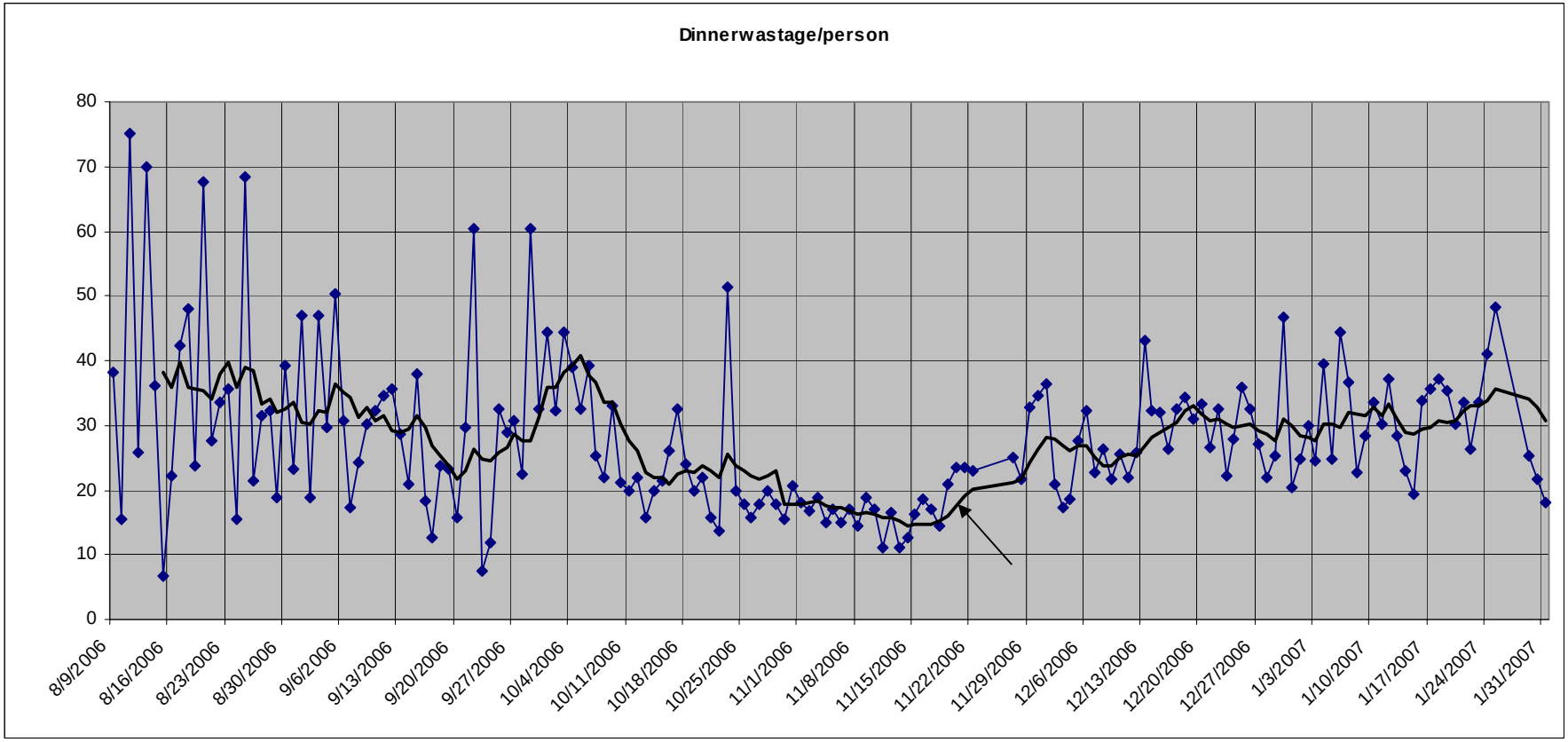
Wastage (in gms) per person trend (actual & weekly moving average plot) for all meals combined (dinner, lunch, breakfast, & high tea).



Arrow points to removal of weighing scale.

FIGURE 3.

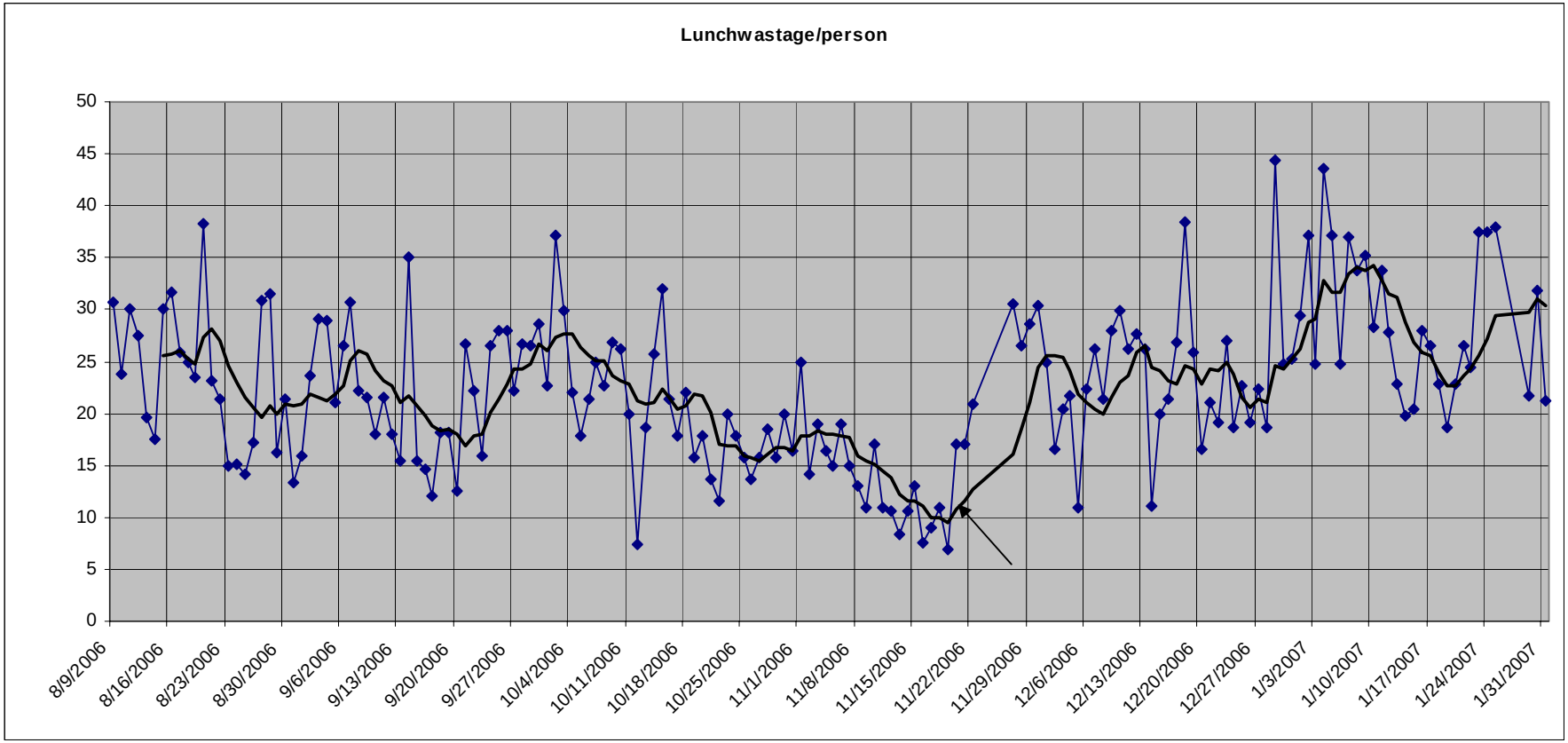
Wastage (in gms) per person trend (actual and weekly moving average plot) for dinner.



Arrow points to removal of weighing scale.

FIGURE 4.

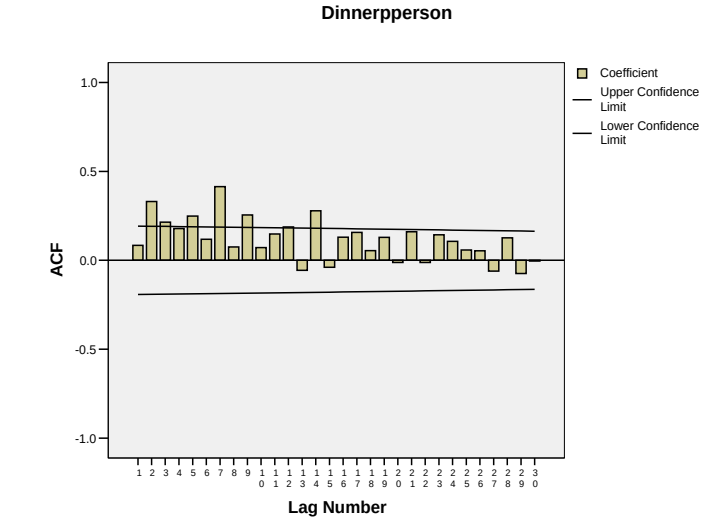
Wastage (in gms) per person trend (actual and weekly moving average plot) for lunch.



Arrow points to removal of weighing scale.

FIGURE 5.

Autocorrelation function (ACF) and Partial ACF (PACF) plots for series 1(pre test) data.



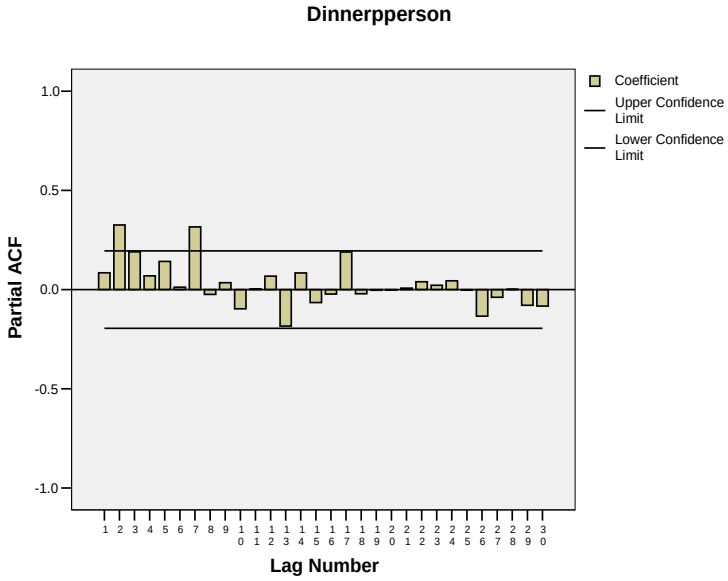
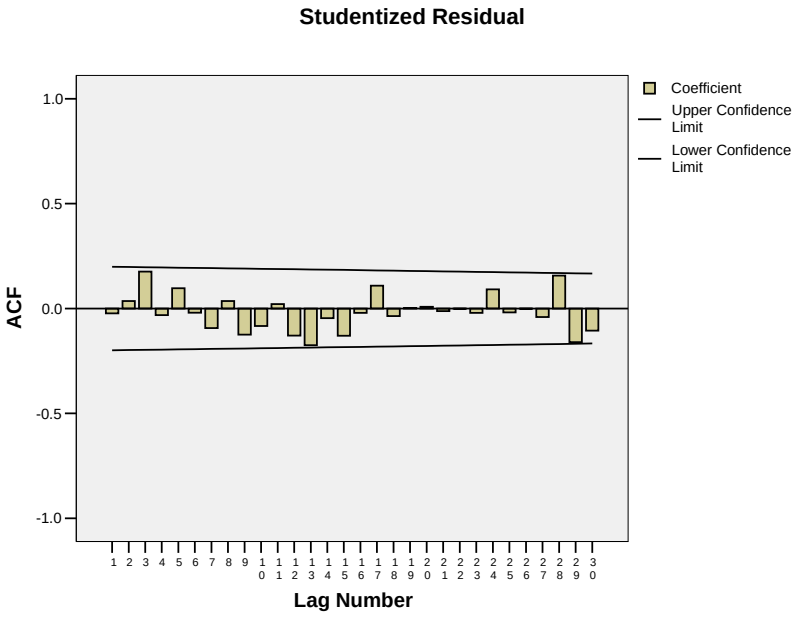


FIGURE 6.

ACF and PACF plots for studentized residuals of regression equation 1 for series1.



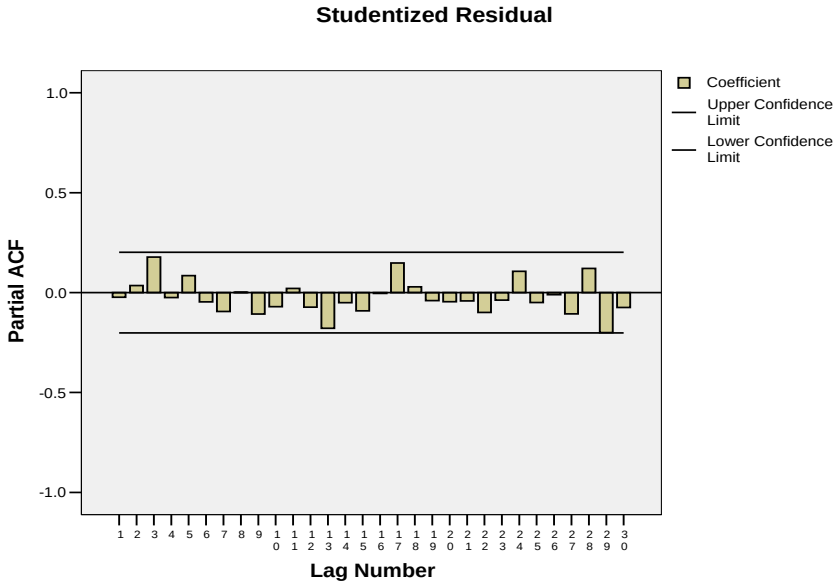


Figure 7.

ACF and PACF plots for series 2 (post test) data.

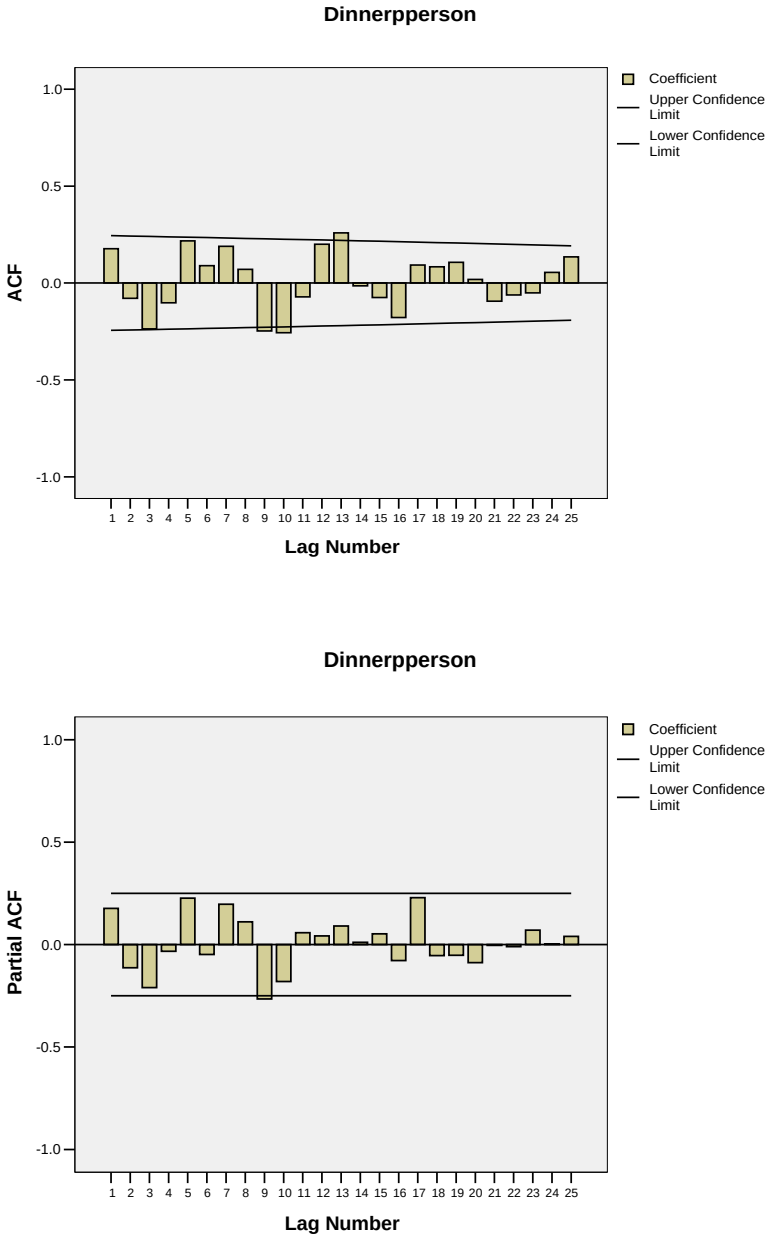
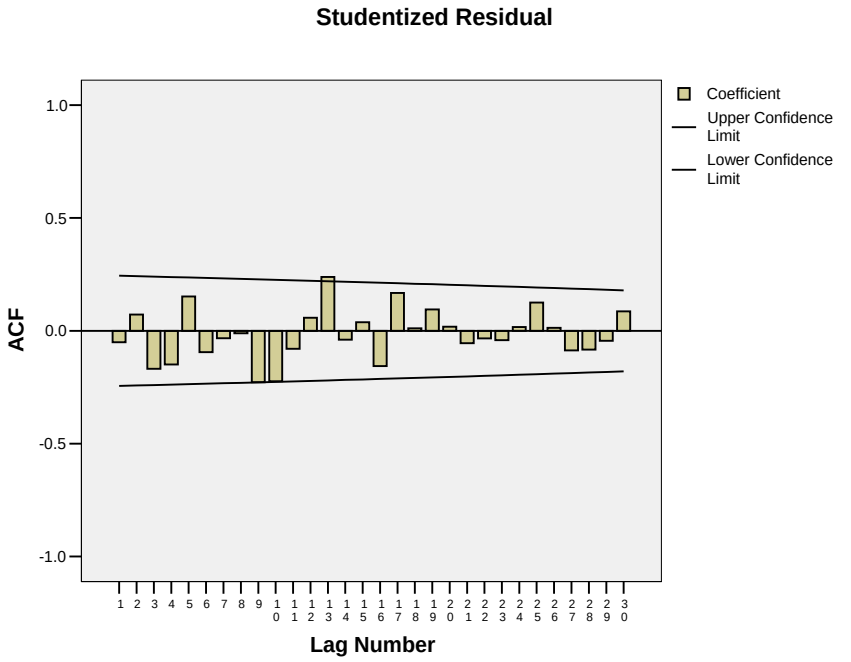
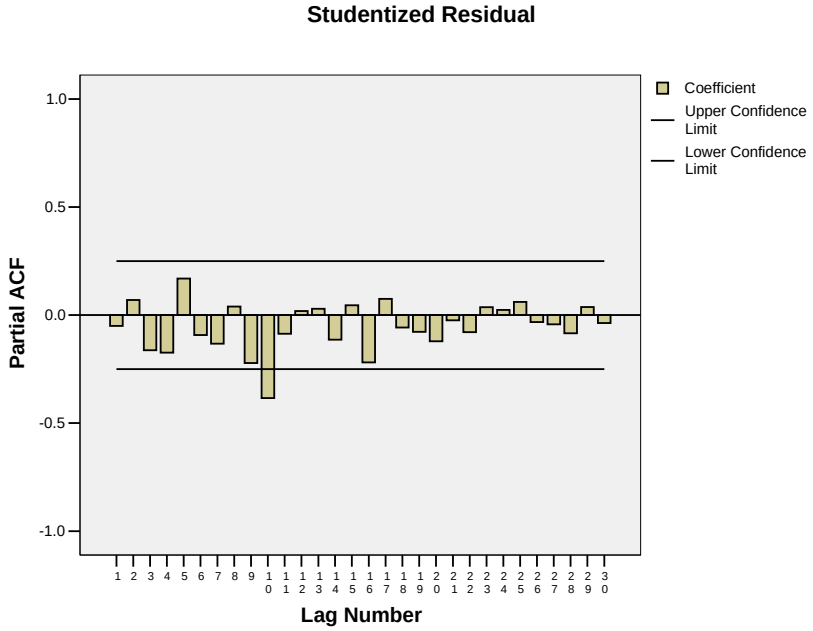


Figure 8.

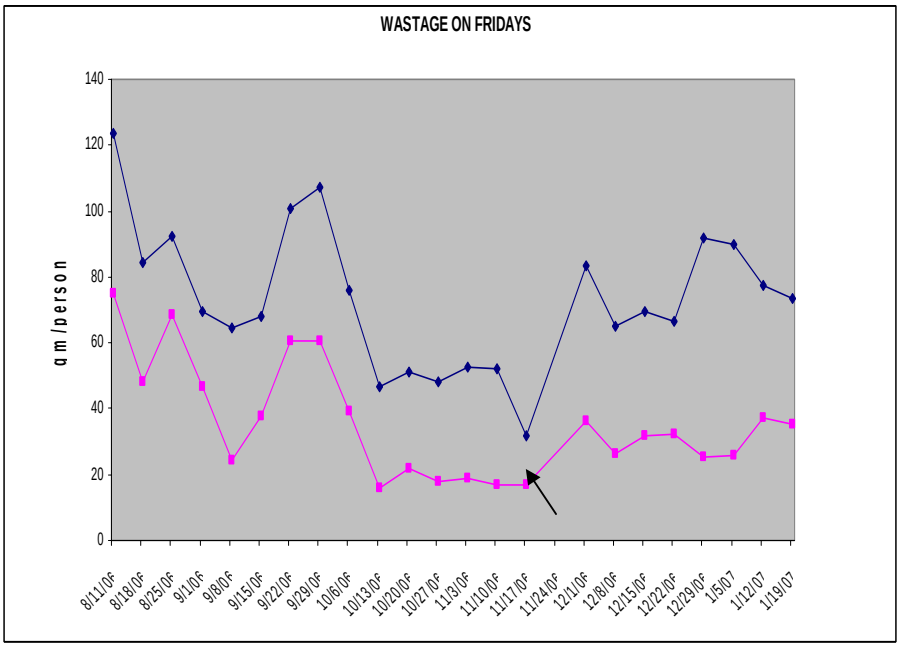
ACF and PACF plots for studentized residuals of regression equation 1 for series 2.





PANEL 2.

Total and Dinner wastage / per person trend only for Fridays across two series.



Arrow points to removal of weighing scale.

APPENDIX A: Online Survey questionnaire

A major endeavour of the outgoing messcom 2006-07 has been to reduce food wastage on all counts. One of the sources identified by committee was the food unconsumed and leftover by student members in their plates. One of the obvious reason was lower quality of food on a given day, and uneatables like peels and chicken bones. But the initial waste figures suggested wastage much beyond estimates accounted for by these reasons. To understand better as to why this is happening, we started collecting waste, measuring it, and displaying it in mess. We are conducting a short survey related to our study. All mess members are requested to respond to it online within a period of next week. It will not take more than 5 minutes of your time. It will be your contribution to a noble cause, as we may leave a small legacy for future batches.

Kindly tick mark in one empty box against each question on six - point scale ranging from 'strongly agree' to 'strongly disagree'.

1 ***strongly disagree***	**2** ***disagree***	**3** ***somewhat disagree***	**4** ***somewhat agree***	**5** ***agree***	**6** ***strongly agree***

	1	2	3	4	5	6
After weighing scale was introduced, I keenly noticed scale reading how much I am adding to the waste						
After weighing scale was introduced, I keenly followed the wastage statistics displayed on white board.						
I think weighing scale made me more conscious about the wastage						
I think I consciously reduced wastage myself.						
I think overall mess members reduced wastage because they became conscious of amount of wastage.						

Did you notice removal of weighing scale (basket remained)?	Yes	No
When did you first notice the removal of weighing scale?		
Currently I have stopped following the wastage statistics displayed on white board.		
After weighing scale was removed, I have stopped noticing wastage (in my plate).		

I do not think weighing scale can change individual wastage habits.						