EXECUTIVE PRESIDENT'S ANNUAL REPORT ON THE ACTIVITIES OF THE COUNCIL FOR THE PERIOD 1 MARCH 2016 UNTIL 28 FEBRUARY 2017

By Ben Gouws

Vice-Executive President, Members of the Institute and Guests, I hereby wish to submit my annual report on the activities of the Institute to the Annual General Meeting for approval. It has been an honour to serve as Executive President of the Institute for the second year of the term. I will reflect on the SAIMAS achievements for the year and none of this would have been possible without the commitment, support and hard work of the Council and the Executive Management members.

1. STRUCTURE OF THE INSTITUTE

The Council of the Institute consists of a maximum of eight (8) and a minimum of six (6) elected by postal ballot, **plus** –

(a) The Chairperson of the Standards Board;

(b) The Past President (if the position is filled);

(c) Presidents: Regions/divisions or their authorized representatives of the registered regions and divisions; and

(d) Chairpersons or their authorized representatives of the admitted organizations.

The members are:

ELECTED MEMBERS AND POSITION	NAME
Executive President	Mr B F Gouws (Ben)
Vice-Executive President	Mr P Munsamy (Preggie)
Secretary & Treasurer	Mr E M Morrison (Eddie)
Members	Mrs L Forssman (Lydia)
	Mrs M J Loubser (Ria)
	Mrs F Kgwefane (Futhi)
Past-President	Mr J Marais (Jimmy)

2. ATTENDANCE OF MEETINGS BY COUNCIL MEMBERS

Executive Management and Institute Council meetings attended 2016/2017

Name	Capacity	Exco Meeting (110) 17 March 2016	Council Meeting (39) 20 May 2016	Exco Meeting (111) 20 May 2016	Exco Meeting (112) 22 Sept 2016	Exco Meeting (113) 26 Jan 2017	Performance
Mr B Gouws	SAIMAS Executive President	Yes	Yes	Yes	Yes	No	4 out of 5
Mr P Munsamy	SAIMAS Vice-Executive President	Yes	Yes	Yes	No	No	3 out of 5
Ms R Loubser	Member	Yes	Yes	Yes	Yes	Yes	5 out of 5
Mr E M Morrison	Treasurer/ Secretary	Yes	Yes	Yes	Yes	Yes	5 out of 5
Ms L Forssman	Editor	Yes	Yes	Yes	No	Yes	4 out of 5
Mrs F Kgwefane	Member	Yes	Yes	Yes	No	Yes	4 out of 5
Mr J Marais	Past-President	No	Yes	Yes	Yes	Yes	4 out of 5 **

** The Past-President is entitled to attend but don't have to attend Executive Management and Institute Council Meetings.

3. ACTIVITIES OF THE COUNCIL

The following activities were performed during the year:

3.1.1. The Annual International Conference

The Conference Committee arranged and presented the 26th Annual Conference with the theme '**PEOPLE, PROCESS & PERFORMANCE – PATHWAY TO SUCCESS'**, at the Euphoria Golf Estate & Hydro, Mookgopong in Limpopo Province. The conference was presented over three days. The number of delegates who attended the conference was 58. The Cable Car trip and dinner on the mountain for the Wednesday evening was cancelled due to possible lightning on top of the mountain. Instead the delegates were afforded an opportunity to explore the estate with golf carts and many delegates realised that they are not the Formula 1 drivers they thought they were. Fortunately, there were no accidents and all carts were returned without a scratch. The team building programme on Thursday consisted of a drumming session where all were taught the African skill of drumming. Whilst some could resonate well with this others preferred to see how low they could go on the limbo dance floor. Needless to say there were a few people with sore muscles where they never even realised they had muscles….

Overall good feedback on the conference was received. Photographs of the conference, as well as the presentations of the presenters have been published on the SAIMAS website at www.saimas.org.za.

Thank you to all delegates who attended and we trust you will join us again this year.

3.2. Workshop

SAIMAS presented a workshop on Spring day in September 2016 with the theme "A **STRUCTURED WAY TO ASK THE RIGHT QUESTIONS TO ARRIVE AT THE RIGHT ANSWERS**".

This workshop provided an insight into how Research concepts can help Management Services Practitioners in their work environment to ask the right questions in the right way to obtain the right information.

Dr Cisca du Plessis from Tshwane University of Technology, a SAIMAS member for years, was the right person to lead the way for the practitioners to arrive safely, having the right information at hand.

She provided practical skills that can be applied in any task that is on the table.
The workshop was attended by 23 members which also included students and interns. This proved to have been valuable to them as they will use these skills learned in the interactive workshop in their studies as well.

3.3. SAIMAS Journal

The SAIMAS Journal is still of the ultimate way of reaching all our members and it continues to be a valuable asset for SAIMAS as an Institute.
The contributions and articles in the Journal are carefully selected to be current and relevant to the job requirements of our practitioners in the field. Therefore, if you have any contribution that can be published please feel free to share it with the editor and it may even be published in a Journal. Please share your success stories as well. We should learn from each other's challenges and that can only happen if we make this visible to one another.
This portfolio is not an easy one and I congratulate the editor, Mrs Lydia Forssman, and all who supports her on an ad hoc basis, for a job well done.
If you have a business and want to give your company some exposure to the readers of the Journal please contact the editor for advertising opportunities and the cost related to that.
Thank you also to the SAIMAS office for the effort to distribute the journals to all our avid readers.

3.4. SAIMAS Website

Our Web site (www.saimas.org.za) is continuously giving SAIMAS a presence on the internet. Please visit the site to make use of the resources that we make available to our members free of charge. Useful links to other relevant web sites are available. The office receives and transmits E-mail communications from the E-mail address, namely saimas@global.co.za.

4. FUTURE ACTIVITIES

4.1. 27th Annual Conference

The Conference Organising team has started with arrangements for the 27th Annual Conference. The title of the conference is
"ACHIEVING ORGANISATIONAL AGILITY"

The dates of the conference are 25-27 October 2017 and the venue will be communicated soon. Calls for abstracts have been sent out and if you by chance missed it, please speak to any of the SAIMAS executive for a copy.
For every group of four (4) from one organisation, the 5th person may attend free of charge so please budget for this early.
The SAIMAS office and the website can be consulted for an update.

4.2. Workshop

The next Workshop will be arranged and details regarding this will be distributed to members as soon as final arrangements have been made.

5. MEMBERSHIP

The membership of the Institute is as follows:

INDIVIDUAL PLUS HON MEMBERS	111
CORPORATE	3
TOTAL	**120**

We would like to see the membership grow and your active recruitment will be appreciated. Be aware of possible membership applications and please feel free to contact the office if you have any enquiries in this regard.

6. FINANCES OF THE INSTITUTE

Our main source of income is the annual conference, individual and corporate membership fees. The annual conference, journal and workshops also constitute the biggest part of our expenditure.

The finances will be dealt with in detail by the Treasurer.

I want to sincerely thank the Treasurer of the Institute, Mr Eddie Morrison, for his dedication and stewardship to ensure continued stability with our finances. Your hard work is appreciated.

I also want to thank our auditors, Lucro Consulting, for time and effort in auditing our financial statements and keeping the financial matters above-board.

7. OFFICE ADMINISTRATION

The back-office work is where things happen and where it is always going crazy busy. I cannot thank our part time secretary, Mrs Gerda Morrison, enough for the work she is doing to ensure that the SAIMAS office is running smoothly and with minimum challenges. Her dedication, time and effort to ensure this is noted and highly appreciated. I also want to thank the Council member responsible for Office Administration, Mr Eddie Morrison, for all his efforts and assistance.

8. APPRECIATION

I extend my appreciation also to all SAIMAS members for your continued support and contribution to keep SAIMAS as an Institute alive and well. Thank you for participation and input.

Last but not least, thank you to the Council members, for your dedication and commitment during the past year. Please also relay my thanks to your spouses/partners for sharing your valuable time with the SAIMAS family.

Warmest SAIMAS Greetings
BF Gouws
SAIMAS EXECUTIVE PRESIDENT

THE 'DARK SIDE OF THE NET' ARTICLE SERIES: Third part

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Introduction

This article is the third in a series that considers what we may term the 'dark side of the net'. Our series looks at a number of practices and activities on the internet that either verge on the illegal or are illegal. Such practices and activities can have serious

consequences for how organisations function and we discuss these in the hope that readers may have their awareness and understanding of these issues reinforced.

In our first article, published in the December 2016 edition of the Journal of the South African Institute of Management Services, we discussed the activity of spam. In our second article, published in the March 2017 edition of the same journal, we discussed the practices and activities of hacking. In this article we focus our attention on bitcoin and crypto currencies.

On Friday 12th May 2017 the British National Health Service, FedEx, the German railway company Deutsche Bahn AG, the Spanish mobile phone and broadband provider Telefonica, and many other companies and organisations in 150 countries across the world (including South Africa) were subjected to a massive cyber-attack. Staff logging onto their personal computers that morning were met with a message indicating that their data had been locked and that they would have to pay a 'ransom' of $300 (approx. ZAR3,900) to retrieve their data. The attack was conducted using the 'WannaCry' ransomware cryptoworm. This software searched for computers that were running an older version of Windows that had not had a security patch applied. When the worm found such a computer it installed a piece of software called 'EternalBlue' (which is thought to have been developed by the United States National Security Agency (NSA) and was itself stolen in a hacking attack on the NSA). According to Groll (2017), the intelligence agency did not actually create 'WannaCry' but played an inadvertent role in mid-wifing the bug. This software then permitted the installation of the 'WannaCry' ransomware which then encrypted the data on the computer and could only be unlocked via payment of the $300. Groll (2017) reports that criminals have so far netted a 'paltry' $50,000 (approx. ZAR650,000) in ransom payments into bitcoin accounts associated with this malware. However, the program has affected more than 200,000 computers worldwide. In Africa, South Africa was the most affected country with approximately 83 websites affected (Sethoga, 2017).

In this article we focus not upon the actual means of attack but upon the means of payment, bitcoin. The hackers in this case required users to purchase bitcoins to the value of $300 and transfer the money to them. Bitcoin not only makes such payments possible but also makes the identity of the recipient of transferred wealth impossible to identify. Here we will discuss some of the key features of bitcoin and how it functions. While bitcoin itself is of course not criminal or actually a part of the 'dark side of the net' its qualities and affordances make it an ideal tool for people who want to remain anonymous and thus provides the currency of choice for those who conduct illegal and deviant activity on the internet.

Bitcoin and Crypto Currencies - a New Form of Money

Bitcoin is the most successful of a series of alternative currencies that make use of advances in computing and cryptography – the science of codes and codes. Bitcoins exist solely in the digital realm and there is not physical manifestation of them (though there have been several instances where pseudo coins have been produced bearing the bitcoin logo). Bitcoin was launched through an academic-styled paper published on 31st October 2008 (Nakamoto, 2008a) and was announced on a cryptography mailing list (Nakamoto, 2008b). The author of the paper and the post to the mailing list was listed as Satoshi Nakamoto though this has proven to be a pseudonym (the real identity of Satoshi Nakamoto is a hotly debated topic. An Australian, Craig Wright has made claim to the identity though this has yet to be fully proven (O'Hagan, 2016)).

What distinguishes bitcoin from other forms of currency, as well as its solely virtual nature, is its use of block chain database technology. Currency is ordinarily transferable between individuals and companies. If the money exists in a material form, such as cash, then ownership is transferred by giving the other person(s) our notes and coins. They then possess the value of the money that the notes and coins depict. They can avail themselves of this value by spending the money for other goods and services. Over the past few years the manner in which we transfer ownership of money has gradually changed and now for any large transaction and many small amounts, we use electronic means and record the transfer of ownership of money on centralised registers. Indeed, according to some estimates upwards of 92% of the money in the world does not exist in a physical form but is recorded on lists and registers which note legal ownership. Many of these central registers are held by banks and similar financial organisations.

Banks keep records of how much money we have with them, credit card and loan companies record how much we owe them. Thus our relative wealth is held not in our physical hands but in (often) electronic records. We store our money in a bank and they lend it out to other users or to other organisations who then loan it to other users themselves. Thus banks serve as a third party, someone who we trust who can record our wealth in their books. To provide this service, banks make money by charging interest on the money loaned to other people. This is the money provided to them by users and they sometimes (but not always) pay users interest on this money. The difference between the two rates of interest is how banks make their money, they lend it for more than they pay for it. Bitcoin offers an alternative in that users can transfer money between themselves without recourse to a trusted third party. This direct form of transfer is conducted using the block chain database technology.

Prior to the application of block chain technology, there were systems by which money could be directly transferred between users through electronic means. However, without recourse to a centralised register, such as a bank, to police the transaction there was always the very real risk that fraud could occur. The block chain technology offers a decentralised register of transactions which is distributed all over the world. There is no single ownership or storage of records by a third party, rather bitcoin operates by having its register widely distributed.

Block Chain Technology

Block chains are a form of database that make use of the principles of cryptography to produce a record that cannot be changed but can be easily verified. The block chain is a distributed database which records a list of actions or changes made. These changes are stored in a list of discrete sequential, records or ‘blocks’. Blocks have two particular features that greatly add to the security of block chains. First, blocks are time stamped at their moment of creation – they carry their exact time of their production within them. Second, each new block on the chain is created with an inherent link to the preceding block. Therefore if someone wanted to alter a block they would have to then alter all subsequent blocks in the chain. These two features mean that once a block has been created it cannot be altered though the information can be easily verified.

Virtual Wallets

When a user wishes to make a transaction they send bitcoins from their ‘virtual wallet’ to another virtual wallet. The transaction is then recorded onto the block chain. Simply put, virtual wallets are a means to store bitcoins. They are pieces of client software that contain a secure folder on a computer (or in cloud storage) in which to store the digital credentials or the private keys used in public key encryption systems of bitcoin to produce bitcoin addresses for transactions. The wallets either contain or access a copy

of the block chain and consult it to determine how many bitcoins are in a user's wallet and whether they have enough to complete the proposed transaction. Bitcoins can also be stored with an exchange or custodian or can be stored entirely off line in what is termed a vault – a file storage system that cannot be accessed through the internet (Villasenor, 2014). This is typically accomplished through either having a computer that is not connected to any form of network that is connected to the internet or through a removable device that stores the bitcoins until their need arises.

To transfer money to someone's wallet they will provide you with an address, this is a list of between 26-35 numbers and letters. The address is created by the bitcoin client and it is advised that each address is used only once with a new one being created for each transaction. As an example of what an address looks like, bitcoinwiki (2017) offers the following example of an address 3J98t1WpEZ73CNmQviecrnyiWrnqRhWNLy. This address is then entered as the destination of the transaction. From an external viewpoint this address carries no information as to the identity of the recipient. Though it may be possible to see what transactions have been made to that address, it is impossible to deduce to whom the address actually belongs without additional information.

Once a transaction has been initiated, the instruction is broadcast to all computers on the internet running the distributed bitcoin software. The transaction is recorded on the block chain by being written into a new block. This writing of a new block or recordkeeping activity is referred to by the disingenuous term 'mining'. It is a long and complex process that requires significant computing power and 'know-how'. This is also referred to as a proof of work and serves as a further security measure – the creation of a block takes significant effort. Once a broadcast of the transaction is made on the bitcoin network, 'miners' can choose to complete the work. The first miner who completes the work is rewarded with new bitcoins themselves but also transaction fees. These fees are small rewards that those initiating the transaction offer so that their transactions are mined. Users who do not offer such rewards may find their transactions take longer to be written to the block chain and be finalised.

Advantages of B**itcoin for 'Dark Net' Residents**

As detailed above bitcoin provides a means by which wealth can be sent to someone without any knowledge of who that person actually is. Accordingly bitcoin has provided a completely anonymous, untraceable and covert system for passing money. As the identity of the recipients and senders of money cannot be traced, money passed around through the bitcoin system cannot be monitored by governments or law enforcement agencies. Transactions can take place that involve illegal activity. There have been numerous instances of this occurring on various fora and play a significant part in facilitating economic activity on the dark net.

Concluding Remarks

Ransomware attacks are likely to get worse in the future so companies and organisations will require enhanced security to protect themselves from such cyber-attacks. The recent attacks underscore the fact that any vulnerabilities will be exploited by hackers and criminals. Even as computing advances provide more secure security software, such vulnerabilities will not simply 'go away'. Companies and organisations will need to proactively avoid the bite of bytes. In the next and concluding article in this series, we turn to some of the fora and communicative means by which people trade information and goods on the 'dark side of the net'.

Further reading

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PREDETERMINED MOTION TIME SYSTEMS (PMTS)

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Introduction

Work measurement is one of the oldest tools used and stopwatch time studies is the oldest type of work measurement performed. In this article work measurement will be briefly discussed with emphasis on predetermined motion time systems. Time is important in work systems because of its economic significance. Within the entire value stream of most organisations the labour content to produce a product or service is a major impactor on productivity and also a major determinant of the cost of the product or the service.

Work measurement

Work measurement is concerned with the scientific determination of the amount of time required to perform a unit of work [1]. Work measurement is very important for improving the productivity of an organisation. It enables management to compare alternate methods and also to do initial staffing. Work measurement provides time standards, the basis for proper planning. Whether the standard will be used for measuring a change in productivity, determining staffing levels, or as a tool for operational planning, it must be developed in some logical and consistent manner.

The terms work measurement and time study are according to Groover often used interchangeably as both are concerned with how much time it should take to complete a unit of work [2]. The immediate objective of all work measurement studies is the development of the standard. There are cases when it is not possible nor practical to set time standards using a stopwatch for time studies and therefor other work measurement techniques were developed.

Work measurement has been defined by British Standard Institution (BSI) as, "The application of techniques designed to establish the time for a qualified worker to carry out a specified job at a defined level of performance". This time is called standard or allowed time. Time study may also be defined as "the art of observing and recording the time required to do each detailed element of an industrial operation". There are according to Groover four principal techniques for conducting work measurement:

(1) Direct time study;
(2) Predetermined motion time systems;
(3) Standard data systems; and
(4) Work sampling [2].

Using work measurement techniques in the traditional way (without computers) can be very time consuming for an analyst. Most systems nowadays have software available to reduce the time needed to develop standards.

If one decides to use predetermined motion time systems there are according to the International Labour Office (I.L.O.), more than 200 different systems to select from [3]. This large number of predetermined motion time systems gives rise to the following questions:

- Do the techniques differ from each other?
- Are the techniques available in South Africa?
- On what grounds should a technique be chosen?

Choosing the most suitable Predetermined Motion Time System technique is possible when answers to these questions are available according to the subsequent discussion.
Predetermined motion time systems (PMTS) and their differences
There appears to be differences between the groups of predetermined motion time systems and they can be allocated based on the differences in three groups ILO [3]:

- Universal predetermined motion time systems;
- Function-related systems; and
- Specific data systems.

Each of these groups of systems is described below.

Predetermined motion time systems (PMTS)
The origin of PMTS can be traced to the 'therbligs' and the first attempt to ascertain time by motion length as done by Gilbreth in chronocyclograph [4]. Therbligs have been used as basic motion units in all PMTS's. In the 1920s, Gilbreth's study of motions led to "rules of motion economy". These rules are used to this day to assist in defining the most time- and energy-efficient Motion Sequences possible. These rules focus on the use of the shortest possible motions, balanced motions, rhythmic motions, symmetrical motions, automated motions, motions with low energy consumption and ballistic motions, while maintaining activities in the mid-range of motions.

So, with the help of two-hand process charts, detailed information can be collected regarding the task. Furthermore, the relationships between the two different activities performed can be established. So, different methods can be charted and then compared, by keeping in mind the principles of motion economy. The best method is then selected.

While these original motion studies proved to be a great advance in scientific management, they could not be considered complete, because they did not assign times to the motions. Thus, it was not possible to fully evaluate alternative methods. The need to fully evaluate the method, including the impact of individual motions on the method, led to the development of Predetermined Time Systems (PTS). PTS represents the marriage of "Gilbreth's motion study" with "Taylor's time study" providing the ability to assign execution times to the analysed Motion Sequence [2]. The result is a truly quantitative evaluation of the work system allowing for the complete optimisation of the method.

Predetermined Time Systems are defined as follows: Predetermined Time Systems are motion times employed in the study and evaluation of manual work elements. Essential indicators for designing workstations and work methods can be derived by using Predetermined Time Systems.
Predetermined Time Systems serve to:

- provide the description of work processes and
- assign (predetermined) time values to the described processes.

Asa B. Segur, a colleague of Gilbreth, is credited with the first attempt to develop a Predetermined Time System, MTA (Motion Time Analysis), this work took place between 1919 and 1924 was based on what Segur called (according to Quick et al) "Segur's Law". It reads as follows: "Within practical limits, the times required for all expert workers to perform true fundamental motions are constant" [5].
In the 1950's, American management consultants brought MTM to Europe. Thus, began a very successful MTM application in Sweden and later in Switzerland. Starting in 1960, the MTM method gained significant acceptance in Germany. While it was initially used as an aid in job design, MTM has gradually evolved from a Predetermined Time System to a complete method for the productivity management of work systems [6]. Today, the framework of MTM building block systems enjoys worldwide acceptance with over 80% of all predetermined time standards work being done with MTM.

In actual practice, the application of any predetermined motion time system may be supplemented by various other techniques including activities such as; time study, activity sampling, estimates, benchmarking, mathematical calculations and self-logging in order to measure those portions of the process not directly analysable with the specific predetermined motion time system.

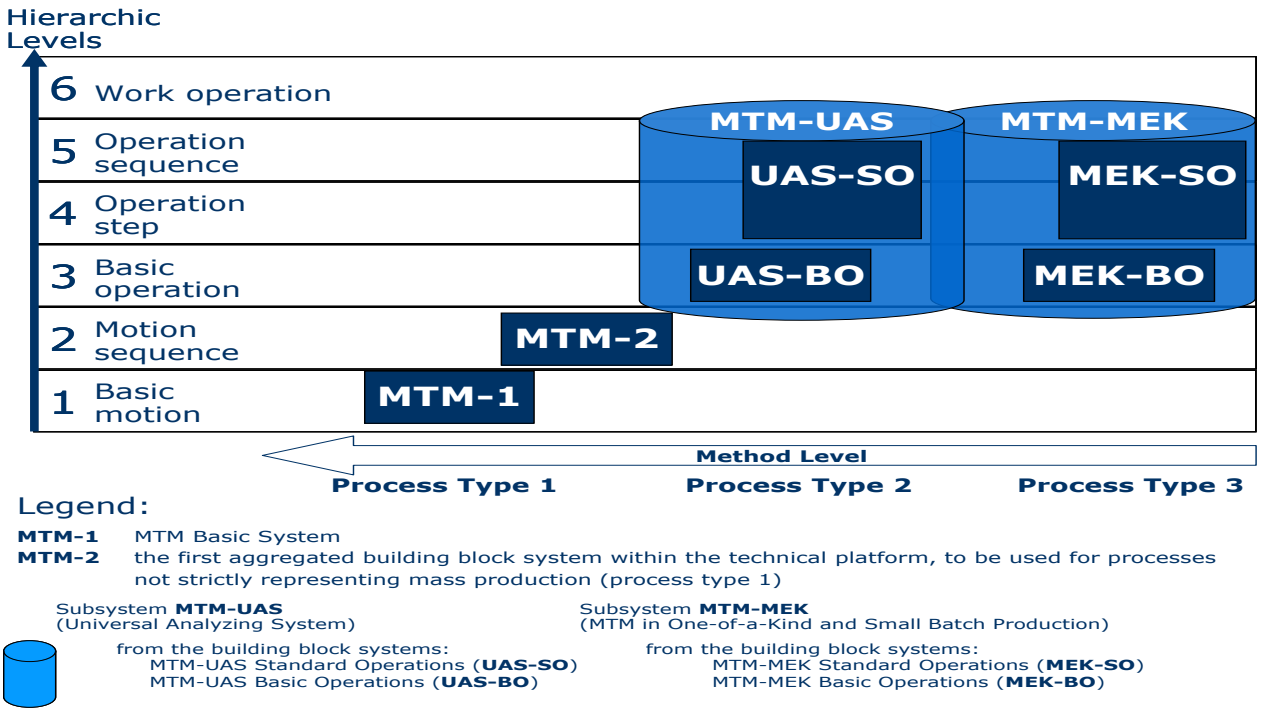
Universal predetermined motion time systems are based on the time that is needed to carry out basic human movements, like all movements to reach for an office desk printer switch and to press the switch. This allows for measurement at different levels. Burman identifies five (5) levels, starting on the first level with basic human movements and ending on the fifth (5) level with specific tasks [7].

The International MTM Directorate (IMD) has adopted the following five (5) systems as internationally accepted systems: MTM-1, MTM-2, SAM, MTM-UAS and MTM-MEK and a hierarchy of six (6) levels are used [6]. The IMD recognises a single "technical platform" comprised of the following four building block systems; MTM-1, MTM-2, MTM-UAS, and MTM-MEK [6]. The IMD's hierarchy (see figure 1) is also starting on the first (1) level with basic human movements but ending on level six (6) with work operations.

These systems support the application of the MTM philosophy in all environments. They are further classified into three (3) different process types, within the general manufacturing environment. An IMD approved and binding English training master for each of these four building block systems ensures uniformity in training and practical application.

Below is an illustration of the building block systems included in the "technical platform".

Fig. 1: Building block systems



Which system is suitable for a particular production environment is decided by the analyst and depends on the process type and the relevant method level. In practice, there are three (3) essential process types, characterised by them using features which allow conclusions about the existing method level.

According to Brisley the generic predetermined motion time measurement system "... intended to be-used and understood by all - not restricted or particular in application" [5]. The best known predetermined motion time systems, in order of the time period in which it was developed, are listed below.

- **"Motion-time analysis"** was developed from 1919 to 1925 by Segur. This technique is considered as the forerunner of the modern predetermined motion time measurement systems [5].

- **"Work factor"** was developed between 1934 and 1938 under the leadership of Joseph Quick by various people, but was only introduced to the public in 1945. From "Work factor" among others "Simplified work factor", "Ready work factor" and "Abbreviated work factor" were developed [5].

- **"Methods-Time Measurement**" was developed by Maynard, Stegemerten & Schwab [6]. It was done as part of a consulting contract issued in 1940 by the Westinghouse Electric Corporation to the “Methods Engineering Council” of Pittsburgh, Pennsylvania (USA), the American industrial scientists; H. B. Maynard, J. L. Schwab, and G. J. Stegemerten worked on the development of the data supporting the MTM basic method. This data was evaluated, revised and fully tested in the industry in the following years. The results were published in the journal “Factory Management and Maintenance” in 1948. The book “Methods-Time Measurement”, which summarises the basics of the MTM methodology, appeared that same year [9].

At that time, no distinction had yet been made between the terms “MTM method” and “MTM-1”, as this was the first system developed for use in modelling work systems. The original MTM technique is now known as MTM-1 and from this technique other MTM techniques, such as MTM-2, was developed [8].

• **"Basic motion time**" was developed in the early 1950's by Canadian consultants J.D. Woods and Gordon Limited. The technique was published in 1958 with a description of the technique in a book titled "**Basic motion time study**" [8].

• "**Motion-time standards**" is a technique developed by General Electric between 1948 and 1950 for their own use [5]. Although Brisley refers to the technique as "Motion time systems" and some comparison was done between the technique and MTM, there is no information available on exactly how the technique works and how it is applied [8].

• "**Master standard data**" (MSD) was developed in the late 1950's by Serge A. Birn Co., Inc. [5]. Before the arrival of MSD Predetermined motion time systems were not widely used according to Crossan & Nance due to the fact that available techniques at the time were too complicated, too time consuming and too expensive [10].

• According to Brisley, MSD is the first of the so-called high order techniques which combined basic movements and allocated a basic time to the combined movements [8].

• **"Simplified PMTS"** is a predetermined motion time system developed by Currie and was published in book form in 1963 [11].

• **"Modapts**" is an abbreviation of "modular arrangement or predetermined time." The technique was developed in Australia by Heyde and was the result of the quest for the faster and easier application of MTM [12]. Modapts appeared in 1966 and it was followed by Office Modapts in 1969 and Transit Modapts in 1974. The Modapts technique and examples for the application of the system was published in the book Modapts Plus [13].

Function-related systems (FVT)

Function-related systems means those techniques that have been developed for use within a particular function, such as administrative work or assembly work and use data blocks to link basic times to the elements of tasks, such as basic time to write a word. Several function-related techniques appeared after predetermined motion time systems were developed. These techniques have been developed to simplify the use of work measurement and reduce the application time. Several function-related technologies for use in factories, workshops and other environments were developed such as "Dimension motion time" developed by General Electric between 1951 and 1956 for use in their own factories [5].

In the following discussion only mentions three (3) of the techniques suitable for measuring work within a particular function, such as "MTM-Clerical" and "Predetermined administrative data system" for administrative work and "Standard Operations Logistics: MTM" for the logistic function.

• **"MTM-Clerica**l" MTM-C brings the advantages of predetermined time measurement to the clerical and service environments of industrial, financial, retail, service, and government organisations. This system was developed by a consortium of American and Canadian organisations, including banks, insurance companies, railroads, and retailers. Level I is built on MTM-1 analyses. Level II is standard data built from Level I data. The two (2) levels of the system provide the desired flexibility, with Level I providing a high degree of detail and accuracy for high volume activity and Level II providing increased speed of application and designed for use in a large variety of

clerical tasks. The system is an effective tool for defining and controlling costs of clerical productivity. MTM-C was developed under the leadership of the United States's MTM Association and the final validity tests of the data was undertaken in 1976 [14].

• **"Predetermined administrative data system"** (PADS) was released in 1989 by the United Kingdom's MTM Association, for use in the measurement of clerical work. PADS has three (3) levels, with MTM-X data at level one (1), 11 primary datablocks and about 81 data values for the measurement of clerical work at level two (2) and some datablocks for whole tasks at level three [15].

• **"Standard Operations Logistics**: MTM" can make a valuable contribution in the organisation and evaluation of the logistic processes [16]. In the context of the logistic activity in different divisions, many comparable operational sequences occur which have an insignificant variation in time. While such typical operational sequences can vary in their complexity, they can be regarded as standard operations within the overall range of logistics. MTM developed and offers applications for this area, including aggregate building blocks for:

- Transport (activities with different means of transport such as stackers, forklifts, hand pallet trucks, and carriages)
- Handling (handle from boxes, containers, bundles; opening and closing packing containers; information – like orders/vouchers processing)

Specific systems
Specific techniques are techniques with standard data for a particular area or a particular company, for example a basic time to complete details on a bank check. The techniques are not widely available outside the organisations that have developed them [8].

Limitations of PMTS
Predetermined motion time systems are not the same and were developed differently (3). One needs to ensure which limitations a system has before using the system. In general the following limitations are most evident:

- All PMT Systems require analysts to receive special training. Although PMT Systems eliminates the need and use of performance rating practical training.
- PMT Systems can only deal with manual motions of an operation.
- Some PMT Systems are not economical for non-repetitive operations.
- PMT Systems cannot be applied to restricted work (process and machines times).
- PMT Systems are restrictive in nature because they have been built on data taken from particular operations and thus PMT Systems provide better results if applied to that type of work/operation only.
- All categories of motions have not been taken into consideration while collecting PMT System data.

Availability of PMTS in South Africa
A number of predetermined motion time systems are available in South Africa. There are several consultants and institutions that provide training in these **techniques. There are several organisations such as the South African MTM** Association who actively promote the use of these techniques in South Africa. Overseas consultants are also willing to introduce new technologies and systems to the South African market.

PMTS and computers

Investments in handheld computers, computerised devices as well as digital technologies such as software and applications are done by most organisations to assist analysts in the work measurement environment [1] [14]. This helped to integrate the output of work measurement into the operational systems of these organisations.

Software and applications are useful tools in direct time study and work sampling; the techniques themselves have the disadvantage of requiring the analyst to be present during the study. Therefore, a time standard cannot be set by direct time study or a work sampling study for a task until the task is performed and observed. The ideal work measurement system, software or application system should include a means of setting the standard for a task in advance. Among the conventional work measurements techniques, predetermined motion time systems (PMTS) and standard data systems (SDS) allow time standards to be set beforehand. Accordingly, the ideal software or application system is likely to include one or both (more likely both) of these two (2) measurement techniques as the core of the system. Some of today's commercially available software and application systems are based on this approach. The desirable features of a system should be to prepare the required documentation that accompanies the standard (e.g. method description), do the necessary calculations, serves a database for time standards that have already been established, and it should provide for the maintenance of those standards.

Criteria for the selection of a work measurement technique

The certain factors should be considered while selecting a particular PMT system for application to a particular industry [18] [19]. These factors are:

- **Complexity**: The technique should not be too complex. The analyst should be able to apply the technique correctly.

- **Data gathering**: The technique should not be an unacceptable data gathering load or data analysis load on the analyst or organisation.

- **Timeliness:** The information obtained through the application of the technique, must be timely provided.

- **Acceptance:** Management and workers must have confidence in the information or results provided.

- **Cost of Installation:** The implementation costs of the technique must be within acceptable limits.

- **Operational Cost:** This is determined by the length of time required to set a standard by the systems.

- **Level of Performance of the System:** The level of performance, contained in the system under consideration may be different from the normal performance in the industry where it is to be utilised. However, this problem could be solved by calibration which is nothing but multiplication of the times given in the charts by a calibration factor (some constant) or by application of an adjustment allowance.

- **Consistency of Standards:** The vital factor to be considered is consistency of standards set by a system on different jobs. The system can be utilised for this on a

trial basis on a set of operations in the unit and examined for consistency among them. The technique should be valid and reliable for the application.

- **Nature of Operation:** Best results can be achieved if the type and nature of operations in the plant resemble the nature and type of operations being studied for developing the system under consideration.

Summary

Using predetermined motion time systems for the determination of time standards is not an uncommon practice in South Africa. The use of PMTS's, however, should be promoted in all fields. The work measurement practitioner should make a choice between the techniques on the basis of the availability of the techniques and the extent to which the techniques meet the requirements.

It is a known fact that organisations use more than one technique in work measurement. Using a PMTS work measurement technique therefore does not exclude using any other work measurement technique and the different techniques must be used to supplement each other. It also means that by applying a technique without using the available software and applications is a waste of time and energy. Due to the fact that the manufacturing sector is shrinking and that the services sector has become the most important economic sector with an annual growth of more than 4%, providing employment to more than 60% of employees and is the main source of economic growth, it is necessary to increase the productivity of the services sector. The measurement of administrative tasks is important for productivity management in the service sector as it is guided by work planning, cost planning and staff planning and all of them are dependent on work standards.

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